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WATER SUPPLY, & SANITARY IMPROVEMENT.

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GAS PURIFICATION
BY
OXIDE OF IRON.

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See Advertisement in last week's JOURNAL, page 574.

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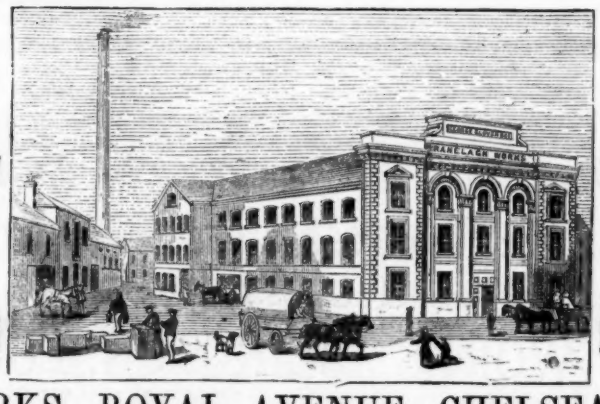

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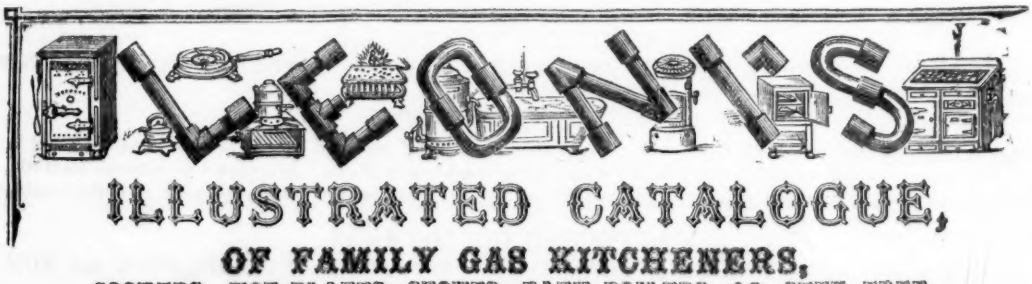

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HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

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IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at Beckton, Hull, and other Gas-Works.

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Sixteen recently erected at Beckton, applied to Covers 30 feet square.

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Special "REGULUS COCKS" manufactured to stand Acid.

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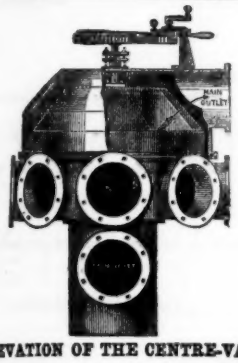
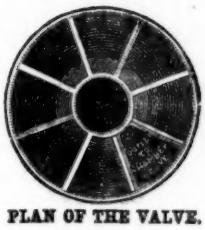
C. & W. WALKERS'

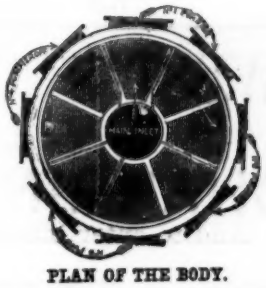
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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GAS PURIFICATION & CHEMICAL Co., LIMITED,

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MANUFACTURERS OF

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PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY,

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

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GAS ENGINEERS, FROME SELWOOD,

MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.

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DRY-FACED VALVES

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The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

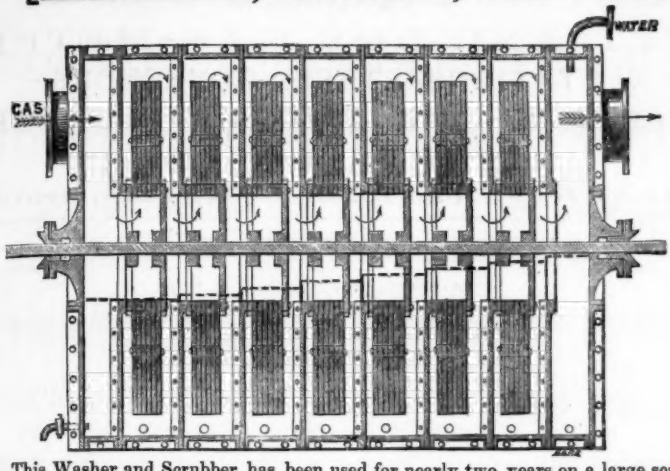
They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

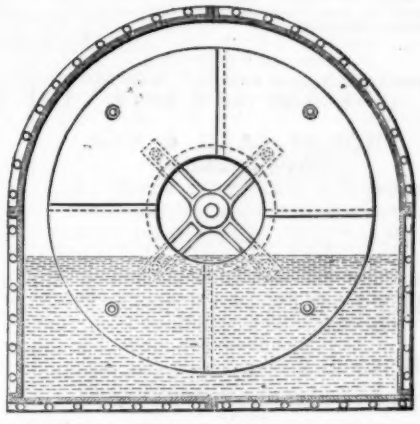
References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

THE "STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

D. HULETT, Esq. *The Gaslight and Coke Company, Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Leeds Corporation Gas-Works, York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber,** so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c. (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6¾	5	3½	2½	1½	¾	½	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
„ 2	8½	7	6	4½	3½	2½	1½	¾	½	0	10 „	57,000	Nil.	75°	66°	32°	21¾	20½	4
„ 3	9½	8	6	3¾	3	2½	1½	¾	½	0	10 „	60,000	Nil.	75°	63°	40°	23½	22	4
„ 4	9½	7¾	6¼	4¼	3½	2½	1¼	¾	¼	0	10 „	65,000	Nil.	74°	68°	33°	24	22½	5
„ 5	9½	7	6	4	3	2½	1½	1	¼	0	10 „	34,000	Nil.	77°	68°	35°	14½	14	5
„ 6	9½	7½	6½	4¼	3	2¼	1½	1	¼	0	10 „	63,000	Nil.	72°	66°	27°	24	22½	4½
„ 7	11	9	7	5½	3¾	3	1¾	1½	½	0	10 „	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	½	¼	0	10 „	78,000	Nil.	73°	61°	31°	28	26½	4¼
9	11	9	7	5	3¾	2½	1½	1	½	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10¾	8½	6¾	5	3½	2½	1½	1	½	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7¾	5¾	4¼	3½	1¾	1¼	½	0	10 „	61,000	Nil.	78°	64°	27°	26½	25½	5
„ 12	11	8½	6¾	—	—	—	1¼	¾	¼	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10¾	8¼	6	4¾	3½	2	1½	½	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				—	—	—	—	—	—	—	—	—	—	
64,000 {	Inlet	2·00	2·00	158·8	72	57	21	{ 4¼	{ Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	} 63
	Outlet	1·50	1·50	0·3	68	57	20		Acid, ounces. . .	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,
COTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.
Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

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LONDON, N.

The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GIRDROD'S PATENT
PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.
In use at the chief gas-works, and giving great satisfaction.
For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.
W. H. BAILEY & CO.,
Brassfounders, Gauge njector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,
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MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
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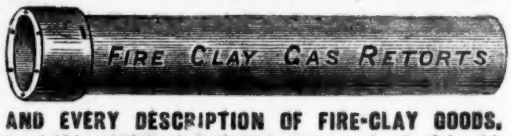

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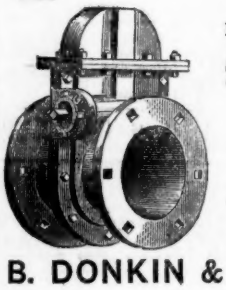

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.
Also Sole Makers of
J. BEALE'S NEW PATENT GAS EXHAUSTERS,
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STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
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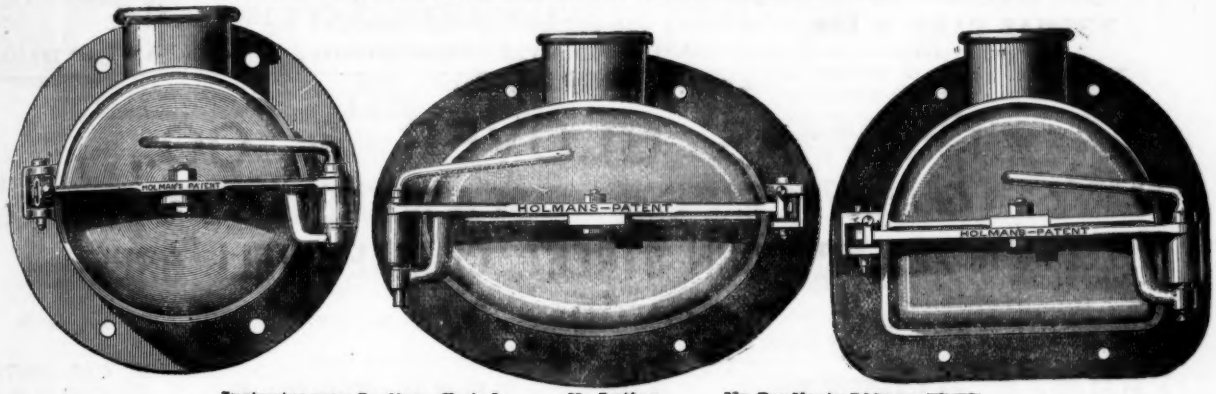
(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

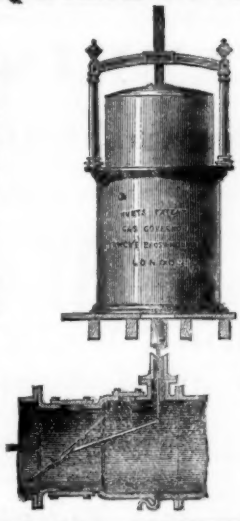
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

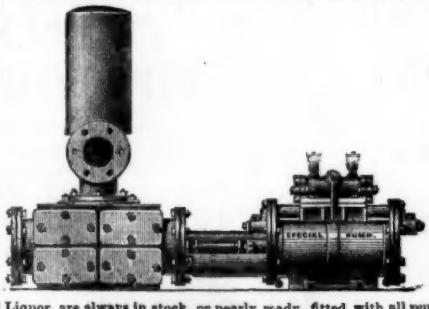
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1¼	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

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Dublin, 1865.

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PATENT DRY GAS-METERS,

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Paris, 1867.

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DRY GAS-METER MANUFACTURERS,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
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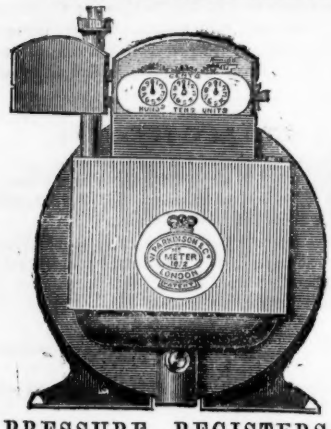
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



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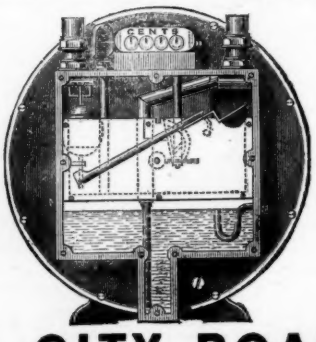
HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

SECRETARY.—*There is no doubt the Board can compel you to remove the lamp-pillars, if they are your property; and, on your failing to do so, can themselves execute the work.*

A COUNTRY SECRETARY.—*It is entirely within the discretion of the Directors to reduce the price of gas, or not, as they please; but as their own interests are largely involved in the prosperity of the Company, we may take it they will do their best to further its ends. Probably nothing better could be done, although 10 per cent. has not been paid, than reduce the price charged.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 21, 1879.

Circular to Gas Companies.

THE half-yearly meeting of the South Metropolitan Gas Company passed off with much *éclat*. There were two topics upon which the Chairman could well congratulate the Shareholders. First of all, there was a continuation of the eleven and a half per cent. dividend, in itself a fact which must have afforded the utmost gratification to the Shareholders. Then there was the announcement that the amalgamation with the Surrey Consumers Company had been assented to, and only awaits confirmation by an Order in Council. We may express an opinion that the arrangement made with this Company will prove highly favourable to the Shareholders. It is certain to gratify those in the Surrey Consumers Company, and, what is more—we were going to say better—will give satisfaction to the customers of that Company.

We turn more particularly to the accounts of the South Metropolitan Company, and look with pleasure upon the large extension of their business. During the past half year the increase in the consumption of gas has been fourteen per cent. There may be many causes for this, but one must be looked upon as the principal. The price of gas within the district attracts consumers, and if the Company continue to accommodate them, as they have up to the present time, and afford facilities for the acquisition of cooking and heating apparatus, the demand for gas will go on increasing in even greater ratio. With regard to working statistics, we can only again express unqualified praise. The amount of coal carbonized, common and cannel, was 58,135 tons, and from this was obtained 593,508,000 feet of gas, or 10,209 cubic feet per ton, of which 9622 feet were sold, leaving 587 feet per ton unaccounted for, or $5\frac{3}{4}$ per cent. of the total make. As our readers have been repeatedly informed, the works of the South Metropolitan Company are undergoing considerable extension. A new retort-house is being erected, in which, it ought in fairness to be mentioned, Mr. West's system of charging and drawing retorts will be employed. Holding, as we do, a very favourable opinion of this system, we are glad to find that it is about to be set in operation on a large scale. Besides this addition to the works, a gasholder-tank of concrete, on Mr. Livesey's own plan, is in course of construction, which will receive a holder larger than any at present in existence. As the Chairman remarked, the ground in which this tank is being made is not the most suitable for a concrete erection; but the skill of an engineer is shown in overcoming difficulties, and with Mr. Livesey's experience in the construction of the tank not far off, now fortunately tight, we have no fear that, although the ground is full of water, means will be provided for preventing it from having any detrimental effect on the structure. We shall be extremely glad, as we said a few weeks back, to see the use of concrete tanks extended. They are cheap, and, if successfully made, are wonderfully strong.

We have before us the last report of the Surrey Consumers Gas Company. Before the next is due, the existence of this Company will have been actually merged into that of the South Metropolitan Company. The report is, not unnaturally, very concise. It simply announces that the accounts show a balance of profit on the half year's working of £22,914, of which £21,456 is applicable for dividend. Out of this sum the Directors recommended the usual division of ten per cent. per annum. This, we take it, will be the last time that the Shareholders will receive so small a dividend as this. When the amalgamation of the two Companies is perfectly completed, it may reasonably be anticipated that a dividend of at least eleven per cent. will be payable under the arrangement, and the Shareholders of the Surrey Company may accordingly rejoice. The accounts of this Company are still published in the old form, and, therefore, no working statistics are given; but we have every reason to believe that the results, under the present management, are highly satisfactory. The Company will carry over to the South Metropolitan a fair reserve and a small depreciation fund, but the amounts are not likely to attract much attention. So far, everything looks, as we have said, *couleur de rose* for the Shareholders in this Company. As the Chairman of the South Metropolitan Company explained at their meeting, the Shareholders of the Surrey Company will, under the arrangement decided upon, share with those of the previously named Company up to ten and a half per cent.; beyond that, "one-half of any additional dividend that may "be payable on the stock of the Surrey Consumers Company "is to be paid to the South Metropolitan Shareholders in "addition to their own share in the extra dividend." After all, a guaranteed ten per cent. would, in our opinion, have better served the purposes of both Companies; but there are, we admit, strong objections to guarantees. In parting for the last time but one with the Surrey Consumers Company, we must congratulate those engaged in the management of the concern, and on having worked it up into its present successful position. At one time they had a difficult part to play; but we are bound to admit that they made the best of their opportunities.

The Manchester City Council are still in trouble as to the way in which they shall apply the exorbitant profits which they draw from the gas consumers. In the course of last year the actual amount of disposable profits was no less than £52,000. According to some in the Council, the whole of this amount must by Act of Parliament be employed in improving the appearance of the city; but the Gas Committee thought otherwise, and seeing perhaps that recent improvements, as they are called, have not conferred the smallest benefit on the ratepayers, they last March recommended, and it was agreed by the Council that the public lighting of the city should be under the control, and at the charge of the Gas Committee, instead of the Lighting Committee, as

formerly. This alteration, it is estimated, will involve a loss of income to the Gas Committee in the current year of £25,000, and here is a direct gain to the ratepayer, who, in a great many instances, knows nothing of the so-called city improvements. He may have gone, as a matter of curiosity, to see the new town hall, and on his way have gaped at large plots of unoccupied land, the reason for the desolation of which he could not understand; but if he, as an individual ratepayer, reflected, he would come to the conclusion that the land, if covered with buildings, would help to relieve him of a part of his onerous burdens. Now comes up a question as to the payment to the Improvement Committee, out of profits, of ten per cent. on unemployed as well as fully-employed capital. It is all borrowed at four per cent., and there are those in the Gas Committee who think the consumers are not well used when fourteen per cent. is charged them for money raised at four per cent. We shall, no doubt, hear a good deal more about this matter, which is of enormous interest to the gas consumers of Manchester.

We are happy to see that an opinion is growing up that a reduction in price should take place in Manchester. Certain members of the Corporation remark that at Sheffield the Company supply the borough and environs for 2s. 4d. per 1000 feet, while at Manchester, as well situated as Sheffield for the manufacture of gas, 3s. per 1000 feet is charged. We ought to have said that the large consumers in Sheffield are charged only 2s., which makes the difference between the price of gas in that borough and Manchester appear very large. It is no new remark of ours that gas consumers can be supplied by Companies as well as, if not better than by Corporations, and the difference between Sheffield and Manchester fully bears out the truth of our observation.

A question as to the application of gas profits has also arisen at Carlisle. Here an understanding was originally come to, that £200 a year should be paid to the city fund; but, beyond this, profits have accumulated until, at the present time, the Council have in hand the sum of £4500, which has been carried to the credit of the city fund, in excess of the £200 per annum. The question now is, What shall be done with this money? By Act of Parliament it is ordered that surplus gas profits shall be applied to some "special object." Some of this money would appear to have been devoted to the Butter Market extensions, the enlargement of the Police Office, &c. We do not here remark on the money spent on the improvement and enlargement of the gas-works, because we regard that as a legitimate expenditure of gas profits; but looking at the matter from the point of view which we always take on this question, let us ask why the price of gas should not be reduced in Carlisle.

The Town Council of Wolverhampton are anxious to make a snatch at the undertaking of the Wolverhampton Gas Company. The concern is profitable, and goes on steadily increasing in extent and importance; not, however, at such a rate as some undertakings have grown. It is ordinarily calculated that a successful Company should double its capital every ten or twelve years, but the Wolverhampton Company have not advanced to this extent. Their growth, however, has excited the cupidity of the Corporation, who now decline to extend the contract for the lighting of the public lamps for a longer period than two years instead of three. The object of this limitation of the contract is to give the Corporation time to consider whether or not it would be advisable or possible to absorb the undertaking. There is, of course, a strong impression prevalent that Town Councils make large profits from gas undertakings. This is true; but they take the profits from the pockets of the gas consumers—*verbum sap.* to those of Wolverhampton, who are now excellently served by a Company who do not make exorbitant profits.

All that Mr. D. Bruce Peebles writes about the distribution and consumption of gas is of interest to both Companies and Consumers. The paper which he read at the last meeting of the West of Scotland Association of Gas Managers is no exception to the rule. We have to thank him for one more valuable contribution, in which, if carefully studied, will be found a large amount of useful information.

Last week six hundred £10 shares in the Bromley Gas Consumers Company, being the first issue of the additional capital of £100,000, authorized to be raised by the Company's Act passed last session, were offered for sale by auction in London. The shares will bear a dividend of seven per cent., subject to the sliding scale. The Company's initial or standard price is 4s. 6d., while at present they are only charging 4s. 2d. per 1000 feet. The prices obtained were very fair, ranging between £12 and £13 5s. per share. The total amount realized was £7295—£1295 of which, being premiums, will not be entitled to dividend. The district of this Company is large and scattered, but fast being filled up. This is conclusively shown by the steady increase in the consumption of gas during the past ten years.

Water and Sanitary Notes.

THE Metropolitan Board of Works are anxious to get rid of some of the shackles which fetter their actions, particularly in the way of spending money. The powers of the Board in this respect are tolerably wide as they stand, still members would like to have them enlarged. They would, for example, like to be able legally to set up a stand in Hyde Park, to which they could invite their friends when there was anything to be seen. They further wish to have power to promote any number of Bills in Parliament, and spend any amount of money in their preparation. Practically the Legislature gives them immunity from all the consequences of their illegal doings; but as Mr. Jones said at the Board meeting last Friday, it is beneath their dignity to be always going to Parliament for relief whenever they exceed the bounds now prescribed. They particularly object to the functions performed by the Government Auditor, which they consider are inconsistent with the Acts under which the Board is constituted and exercises authority. There is one individual deeply interested in this question, to whom no reference was made last Friday, and that is the Metropolitan ratepayer. If the Board were really an elective body, as Mr. Jones would have us believe it to be, chosen by the ratepayers for a limited period of service—constituted, in fact, just like Parliament—there would not be the smallest objection to giving them all the powers which Parliament enjoys of spending money. But, as a matter of fact, the Board is composed of mere Vestry delegates, who hold their places so long as the Vestries they represent keep them in office; and that is, as a rule, for a long period, which the ratepayers have no power to curtail. We wish the Board every success in its new enterprise, but at the same time earnestly commend it to the watchful attention of the ratepayers, who are the parties most concerned in the issue.

Dr. Frankland's report for the past month on the composition of the London waters may be considered as highly satisfactory, notwithstanding the fact that the majority do not approach to the standard of excellence which our severe analyst desires to see imposed. It is admitted that all the waters supplied from the Thames and the Lea were efficiently filtered, and in this report we read nothing of "living and "moving organisms," which so frequently figure in reports, if they do not in the water. London remains in a very healthy state, the death-rate continuing below the average of preceding years. Thus no outcry is made about the chemical and physical condition of the waters, of which, at times, Dr. Frankland makes so much. But at present we must not boast. It may be that, even as we write, preparations are being made by a higher power than we can control, which will bring about an outbreak of epidemic disease. Should this take the form of any of those complaints which are supposed to be propagated by what is called "impure water," we shall, no doubt, hear a good deal about it.

Cardinal Manning continues his misguided efforts to obtain for London what he considers would prove a better and more efficient water supply. We presume that, as to the quantity supplied, his Eminence is quite content; for he must admit that thirty-four gallons a day per head of the population is a quantity amply sufficient for all purposes. What the Cardinal would require in the way of quality is quite clear to us. He would lean upon Dr. Frankland and the Metropolitan Board of Works, and desire a hard well supply in preference to that now furnished from the river. A practical resolution was come to at a private gathering at the Cardinal's house last Thursday. It is now thought that the Metropolitan Board of Works is not the influential body once supposed, and therefore water reformers are on the look-out for some other, to whom they can carry their grievances, and ask for help in finding the money needed to remedy them. The Corporation of the City of London have been selected by Mr. Beal as the body most likely to have it in their power to give them the necessary assistance. No doubt, if the Corporation entered heartily into the business, something might be done to carry out the views of the Metropolitan Municipal Association; but the Metropolitan Board would then appear as a formidable rival, having undertaken the matter when the Corporation had stood obstinately aloof. The Association may take their memorial to Guildhall, and await with quiet composure the answer they will receive from the Common Council. But we

know perfectly well that they will not obtain help from this quarter. The Corporation have their hands full, and with many undertakings which cannot be made to pay, they are not likely to indulge in the luxury of another, the management of which would be costly, and, if neglected, ruinous. Of course, we consider purchase in any case out of the question; but, as we have said, there are ways and means of acquiring the property of the London Water Companies without involving a large present expenditure. When, however, it is proposed to make a radical change in the quality of the supply, a number of questions come up for discussion, which are not easily answered. A change of supply is no doubt to be found without much difficulty, and that at no great distance from our midst; but to bring the water to London, and distribute it, is another matter. However, this question may stand over for the present. When we obtain the Bill which the Metropolitan Municipal Association will endeavour to persuade the Corporation to promote, we shall know more of their aims, and be better able to judge of them.

It is a happy thing to find that the Corporation of Nottingham are well content with the terms upon which they have acquired the undertaking of the Nottingham Water Company. They have every reason to be so, for, as a matter of fact, the property was bought cheap. We are sorry, however, to see evidences of a desire on the part of the Water Committee to make a surplus profit on the undertaking, when it comes under their management next year. Before all other things, a water undertaking in the hands of a Corporation should be simply self-remunerative. We have repeatedly explained the terms on which the Nottingham Water-Works Company have parted with their property, and they will be found reported in another column. All we have to say now is that both Company and Corporation should be well content with the terms arranged by the good sense of the parties concerned, and the wisdom of Parliament.

The Town Council of Liverpool are now awaiting with no little anxiety for the result of the poll of the ratepayers which is to decide the fate of the Vyrnwy scheme. It is much to be regretted that the carefully-prepared plans of the Water Committee were not acceded to by the ratepayers at their statutory meeting; but the Liverpool public are peculiar, and we fear the result of the poll will not differ from that of the public meeting.

Manchester having built the finest town hall in the kingdom, at a cost, it is said, of upwards of a million sterling, is just now severely exercised about the means of disposing of the sewage of their city and neighbourhood, which, it is estimated, will cost only about half a million. The citizens are no doubt proud of their magnificent municipal building; but before they commenced this elaborate piece of masonry they might just as well have considered the conditions under which a large number of the population exist, so far as regards the means which the Corporation now have of relieving the inhabitants of their excreta, and purifying the rivers, the waters of which are held to be so detrimental to health. Cities, however, like individuals, are fond of show, and they would rather expend money upon edifices, grand indeed, but of limited value, than upon the more useful undertakings which are calculated to promote the health of the people. The gas question has been referred to above, and it only remains to mention here that if the surplus gas profits are to be applied to works of public utility, they might years ago have been employed in improving the drainage of the city and cleansing the rivers.

The Moorfoot scheme for the supply of water to Edinburgh concerns the inhabitants of that city in a very vital manner. We should have been glad to find that such an important body as the Edinburgh Water Trust could have kept faith with their constituents, in bringing to their city an adequate supply of pure water, at a reasonable cost. The Edinburgh case must be held out as a caution to the ratepayers of our Metropolis, who may some day be subject to the domination of a body like to the Edinburgh Water Trust. It is not surprising, notwithstanding all that has taken place, to find what the Moorfoot scheme will actually cost the people of Edinburgh. It has been decided to call in an independent Engineer and an Accountant, and may Heaven help them in their endeavours to decipher the accounts of the Water Trust.

The tedious inquiry into the unsanitary condition of the city of Dublin was likely to be brought to a conclusion last week, and what will come of it we do not know. If the Afghans or Zulus had gone to Ireland and treated Dublin as it was proposed to treat Cabul, and as we actually did treat Cetewayo's kraal, we should know what to say; but, under the circumstances, Dublin must remain for years to come a spectacle for the wonder of some, and the indignation of others. Still, knowing as we do the crying sanitary evils which afflict Dublin, we can find few ratepayers who will honestly put their shoulders to the wheel, and endeavour to remedy the evils which are so patent. If this had not been the case, Dublin would have been by this time as well drained and scavenged as any city in the world. But the worst of it is that a long reign of misgovernment led the Irishman to look for legislative assistance in everything he undertook. He used to look to the Central Authority for all he wanted in the way of money to effect public improvements. Now he seeks to palm his wants upon the Irish Church Surplus Fund, the money of which cannot possibly be used for any such purpose. We doubt very much whether Dublin can be effectually drained at an expenditure which the Corporation can afford to incur. We leave the matter of the purification of the Liffey out of the question, for, knowing its banks well, we never discovered, except in a few instances, any objectionable effluvium arising from its waters. Still, Dublin must be drained, and the Corporation must do it without Government assistance.

A Large Contract Open.—It will be seen from an advertisement in another column, that the Directors of the South Metropolitan Gas Company are asking for tenders for a three-lift telescopic gasholder, 214 feet in diameter, and 53 feet 6 inches deep. It will thus rise, when full, to nearly 160 feet, and contain more than 5 million cubic feet of gas.

Peebles's Patent Needle Governor.—The Prize Committee of the Royal Scottish Society of Arts have awarded to Mr. D. Bruce Peebles the Keith Medal, value ten guineas, for his paper on "The Needle Gas-Governor, and on Gas Illumination," read before the Society, and illustrated by numerous experiments and apparatus, on the 14th of April last.

The Late Mr. Johnson and the Freemasons.—Many of our readers will be pleased to hear that the exertions of the friends of the late Mr. Johnson (who was for so long connected with the Chartered Gas Company) to secure the election of his only son into the Freemasons School, were successful. At the polling on Monday, the 13th inst., the boy was returned second on the list, having secured 1734 votes. Next year similar efforts are to be made to place a daughter in the Freemasons Girls School, and we mention the matter thus early, so that those who have votes for the Charity may keep them disengaged to assist in so deserving a case.

Carlisle Corporation Water-Works.—From the accounts of the Water-Works Committee of the Carlisle Town Council, presented to the meeting held last Tuesday, it appears that the net cost of works to June 30 was £42,046 16s. 4d.—£693 4s. 9d. having been added during the preceding twelve months. The receipts for the year were £7817 18s. 8d., and the expenditure £5455 12s. 10d., leaving a profit of £2362 5s. 10d. The amount of loans authorized were £47,000, of which sum £28,862 is still owing, the remainder, £18,138, having been paid off.

Appeal against an Assessment.—The Altrincham Gas Company having recently given notice of appeal against the amount of the assessment of their works and plant by the Assessment Committee of the Altrincham Union, the cause was appointed to be heard at the Knutsford Sessions on Monday, the 13th inst. Previously, however, to the day of hearing, the Committee of the Union consented to reduce the assessment from £3150, at which it was fixed, to £2800. In support of their appeal the Gas Company had retained as witnesses Mr. Cross and Mr. Newbigging, of Manchester, and Mr. Farrar, of Bury.

Lancaster Corporation Water-Works.—The arbitration between Mr. Garnett and the Corporation of Lancaster, which was last week reported as unexpectedly interrupted by the withdrawal of Mr. Garnett's counsel from any participation in it, has now been concluded. The Arbitrator (Mr. F. J. Bateman, C.E.) at the adjourned proceedings repeated his intimation that he did not wish to hear evidence of any witness's opinions as to the damage; he only wanted facts, and on these he himself would judge. Although notice had been served on Mr. Garnett's representatives of the intention of the Corporation to proceed *ex parte*, no one was present on his behalf. The amount claimed is £30,000 for damage done by the drainage of 2800 acres of moorland lying to the east of Abbeystead Fell and to the north of Tarnbrook Fell, in the parish of Over Wyersdale, near Lancaster. By the Lancaster Corporation Water-Works Act, 1876, the Corporation were empowered to enlarge their Abbeystead reservoir from 76½ million to 185 million gallons, and the length of the conduits and branch-pipes on Mr. Garnett's land is 8750 yards. Evidence was now given as to the extent of land affected and of the conduits, the two principal streams touched being the Tarnbrook Wyre and the Marshall Wyre. The works, it was stated, intercepted water from about 2700 acres and left the rest of Tarnbrook untouched. The rainfall on that area was on the average about 54 inches per annum. The main conduit was 6805 yards, and the branches 1945 yards long, connecting the old conduit with the new one. The Engineer of the Corporation (Mr. J. Mansergh, C.E.) valued the easement taken by the Corporation, in the enclosed lands (580 yards) at 2s. per yard, and in the unenclosed lands (8170 yards) at 1s. 8d. per yard. The pipes were 6 inches at one end and 18 inches at the other, and there were from 50 to 60 manholes, each occupying about two square yards. The pipes were laid 5 or 6 feet below the surface. The old lines would not require repairing above once a year, and then the surface was restored. They would not require to be inspected frequently. Mr. Thomas Fenwick, C.E., of Leeds, estimated the value of the land "as land" as almost *nil*; but he added that as a question of compensation he had known it vary from 1d. to 7d. a yard. It ranged generally from 2d. to 3d. a yard, and he believed that 1½d. a yard would be the full compensation to be given to any owner. That would be 2s. 6d. a yard, or £1093 15s. at 20 years purchase. He did not believe Mr. Garnett could utilize the water in any way, and he thought it was of no pecuniary commercial value to him. Its value in the locality was for domestic and agricultural purposes. Mr. Garnett could not sell it, nor make any money out of it, nor could he obtain an Act of Parliament to enable him to do anything with it. Mr. John Newton, C.E., of Manchester, gave similar evidence as to the lack of any commercial value in the water, and estimated the value of the easement at 1s. 8d. a yard, which gave £729 3s. 4d., and he added £145 16s. for compulsory sale, making a total of £875. The Arbitrator, at the close of the evidence, said he would take time to consider his award. [See "Legal Intelligence," p. 625.]

METROPOLITAN WATER SUPPLY AGITATION.

Cardinal Manning, Mr. J. Beal, and the representatives of nine Metropolitan Vestries, have joined hands in order to move the Corporation of the City of London to take up the water question. Mr. Beal pathetically recites how the Metropolitan Board, "in a moment of energy," tried to do battle with the Water Companies, "but only to be silenced by the "Home Secretary and surcharged with costs." Mr. Beal and his friends have endeavoured to create a Municipality which should deal with this and other matters. They have also tried to amend the constitution of the Metropolitan Board, so as to make that body equal to the task of undertaking the entire water supply of the Metropolis. But all these efforts having failed, it is now resolved that the Corporation shall be asked to give the necessary notices for the introduction of a Bill which shall provide for the further regulation of the Water Companies, and, if deemed requisite, for something more, to the extent of buying up the Companies and transferring their undertakings to a public authority, such authority to be a body "nominated by Parliament or created "for the purpose." Such is the programme which was agreed upon one evening last week, at a meeting held at the residence of Cardinal Manning, near the Vauxhall Bridge Road, Westminster; and thus we are presented with one more phase in the agitation respecting the London Water Supply.

That such a step as this should be taken while the Home Secretary is known to be engaged in the investigation of the facts relative to the entire subject, seems to prove that Mr. Beal and his friends are not very confident that Mr. Cross will do exactly as they wish. Cardinal Manning says that at the end of last session he gave notice to Mr. Cross of the probability that there would be some action taken in reference to the water supply during the recess. But Mr. Cross was to look upon this as so much friendly help, and not as being in the nature of antagonism. But we do not see that giving notice of a Bill will help the Home Secretary. In the course of a little time Mr. Cross will have all the facts of the case before him, and he will then be in a position to prepare his own scheme. Very probably he will confer with the Water Companies in order to see how far they are disposed to accept the terms embodied in his project, and it is just possible that the Water Companies and Mr. Cross may come to an agreement. If not, Mr. Cross will be perfectly able to bring his own proposals before Parliament, whether anybody else has anything to propose or not.

One point of considerable importance with relation to the control of the London Water Supply has been made sufficiently clear. Mr. Cross has explicitly declared that if the Water Companies are to be superseded, he does not consider the Metropolitan Board to be the proper Authority to take their place. This, of course, applies to the Metropolitan Board as it exists. If Mr. Cross were enabled to reconstitute the Board, his objection might disappear; but we very much doubt whether Mr. Cross is disposed to undertake the formidable task which thus presents itself. No small measure of reform will be requisite in order to make the Metropolitan Board equal to the fulfilment of those important responsibilities which devolve upon the Water Companies of the Metropolis. London, as comprised within the tables of the Registrar-General, is very much the same in area and population as London under the Metropolitan Board. The area of each exceeds 75,000 acres, and the difference in area is only 128 acres, the larger space being that of the Metropolitan Board. In 1871 the population of the larger area was about 12,000 more than that of the smaller. Hence we may treat the two as identical. We now find the Registrar-General estimating the population of his area at 3,621,000 for the middle of the current year. This, therefore, may be reckoned as the population of the area subject to the Metropolitan Board. Taking Lieut.-Col. Bolton's report for September, we observe that the estimated population supplied within the districts of the London Water Companies is 4,264,540. Thus we find that outside the limits of London, as known to the Metropolitan Board, there exists an area supplied by the London Water Companies, which contains a population more than equal to the present number of inhabitants in Manchester and Salford combined, the surplus yet remaining being enough to populate a city larger than Norwich. The magnitude of the difference is also likely to increase, seeing that the mains of the Companies extend over districts which are probably augmenting in population more rapidly than the central territory. The district of the Kent Company extends to Dartford—including Bromley, Chislehurst, and Bexley. The Lambeth Company send their supply nearly as far south as Croydon, the West Middlesex Company reach to Hendon, the East London Company to Woodford, and the New River Company to Hornsey. As we remarked when discussing the debate on Mr. Fawcett's motion last session, the enterprise which could furnish a supply of water to the population of so vast an area, is one which ought to command respect. Throughout this immense extent of city and suburbs a supply is given exceeding thirty-two gallons per head of the population, of which twenty-five gallons would be for domestic purposes.

It is for the present impossible to extend the jurisdiction of the Metropolitan Board over such an area as that which is thus occupied by the London Water Companies. If the Board were allowed jurisdiction over the outside area for the purposes of the water supply only, it would be very difficult to provide for the proper representation of the outside districts. This population of 600,000—likely to be a million in a few years—would unquestionably require to be represented at all sittings of the Board and its Committees at which matters connected with the water supply were dealt with. But it would not always be easy to determine where a line should be drawn, and dissatisfaction would be likely to ensue. If we look to the Corporation, we see there a body even less available for this purpose than the Metropolitan Board. To create an entirely new body, as a species of Water Commission, to take charge of the water supply, would be a facile plan, but it would have the disadvantage of introducing a new Authority where Authorities are already considered to be too numerous. If the existing Authorities are unsuitable, and likewise incapable of being adapted to the purpose in view, and if, furthermore, it is undesirable to create a special Authority for this particular work, the only remaining course appears to consist in effecting some improvement on the existing lines. The foundation may remain unaltered, but the superstructure may be modified.

The present position of the Metropolitan Board with reference to the water supply is somewhat remarkable. The words of Mr. Cross show that the Board must no longer hope to obtain possession of the supply, unless some change in the Government of the country should bring about an altered policy at the Home Office; and, in the next place, the Government Auditor has decided that the Board may not spend money in seeking parliamentary powers to compete with the Water Companies or to purchase their undertakings. In fact, the Board appears to be fairly shut out of doors on this subject. Certain powers in reference to the water supply are possessed by the Board; but the powers it thus possesses the Board refuses to exercise. This crooked condition of things says little for the wisdom with which the Metropolis is governed. What the Board would do, it must not; and what it may do, it will not. It is a body both sinned against and sinning. Mr. Cross passes it by, and the Auditor snubs it. The Metropolitan Board in turn loftily ignores the Water Companies, treating them as reprobate corporations, incapable of good. Something like retribution has overtaken the Board in this matter. Having refused to exercise its powers under the Act of 1871, it has been denied the powers it sought in 1878, and is now given to understand that it ought not even to have asked for those powers. Under the Act of 1871, the Board has power to require any Water Company to provide a constant supply of water in any part of its district. To this power there are some reasonable limits; but the Board has made not the slightest attempt to give effect to this provision, the plea for its inaction being that the Board of Trade has laid down unreasonable regulations with regard to the fittings with which houses are to be furnished before receiving the constant service. Nevertheless six out of the eight London Water Companies are, as Colonel Bolton says, "moving in the "matter, and giving constant supply under the provisions of "the Metropolis Water Act, 1871, in a portion of their dis-"tricts." So far has this gone, that, according to the last monthly report addressed by Colonel Bolton to the Local Government Board, 131,000 houses out of 568,770 are now receiving the benefits of the constant service. Thus nearly one-fourth the entire area has the constant supply, and this has been brought about by voluntary action on the part of the Companies, without any pressure from the Metropolitan Board, the only influence exercised by the latter being one of discouragement. Within the City the Corporation exercise authority under the Metropolis Water Act, and there we find something like co-operation between the Local Authority and the Water Company. With the aid of the Sewers Commission, the City is being furnished with hydrants fixed on mains continually under pressure. Had the Metropolitan Board been the Local Authority in the City as elsewhere, there is too much reason to fear that this valuable protection against fire would not have been adopted.

We, long ago, suggested that the Metropolitan Board was putting itself out of court on the water question. In this matter it is now simply "nowhere." It has attempted too much, and yet has done too little. As some remedy for its misfortunes, the Board has just adopted a resolution—"That "the authority of the Government Auditor to limit the juris- "diction of the Board by disallowing expenditure, without "such disallowance being subject to an appeal to a superior "court, is inconsistent with the purpose of the several "Metropolitan Acts under which the Board exercises au- "thority." It would be well, at the present crisis, for the Board to consider how far it has damaged itself by failing to exercise its authority under certain Metropolitan Acts. Has not the conduct of the Board itself been "inconsistent with "the purpose" of at least one of those Acts? The resolution just passed is declaratory, and that is all. It is a lamentation floating on the winds. Perhaps the Works Committee, who now have the subject under consideration, may propose some effort for loosening the iron yoke imposed by the Government Auditor. It certainly seems strange that a great Metropolitan Authority should be thus tied and bound, and the incident of the disallowance was by no means grateful to the feelings of the Metropolitan public. As ratepayers, the inhabitants of London might feel glad that there was some check upon possible extravagance; but as citizens, they probably felt that there was some humiliation in seeing the chief Metropolitan Authority brought to book by a gentleman from the Treasury, who happened for the nonce to be empowered to act as Auditor, and of whom nobody knew anything in particular. The Board enjoyed some sympathy under the circumstances, and an Act of Parliament was obtained to set matters straight. But the disability remains, and the Board is required, in reference to the water question, to await the pleasure of the Imperial power.

The Metropolitan Board being thus disabled, the Corporation are to be asked to enter into the fight; or, as Mr. Beal puts it, "come to the rescue." The Lord Mayor and his train of civic dignitaries may perhaps reply that they have no reason to complain of anything in their own district. They drink the water of the New River, and there are hydrants in their streets. Why should the Corporation molest the Water Companies? Moreover, is not Mr. Cross paying active attention to the subject, with the pledge that he will do his very best to remedy any evils or defects which he may discover? Cannot Mr. Cross be trusted? Complaint is made that the Companies charge for their water supply on the basis of rental. But while this is the only available basis, the New River Company charge on one-third only of the annual value in the City. If the water supply were to pass into the hands of a Local Authority there would be the same basis of charge, and there would no longer be the same considerate abatement. The City, it may be said, has nothing to gain in agitating the water question. On the other hand, it has peculiar reasons for letting the matter alone. The water question, more than any other, if pressed beyond a certain point, involves a change in the local government of the Metropolis. The Corporation can scarcely desire to set matters moving in that direction. The civic constitution is not likely to be strengthened by change, but it may be weakened. If Mr. Cross is left to his own devices, it is probable that he will let the local government of the Metropolis remain unaltered, and will content himself with bringing forward a measure involving some new regulations with regard to the water supply. But if this be the mode of proceeding, the Metropolitan Board will have to give some guarantee that it will fulfil its duties under the Act, so that the new law shall not merely "lie upon the table," leaving the Water Companies to be a law to themselves.

San Paulo Gas Company, Limited.—The Directors of this Company, in their report to the Shareholders on the results of last half year's working, state that the total receipts for public and private lighting, and rental of meters, &c., amounted to £10,931 9s. 9d., as against £8417 17s. 7d. in the corresponding six months in 1878. A portion of this apparently large increase was, however, caused by the differences in exchange—£1179 1s. 8d. being written off on this head. The net amount of revenue carried to profit and loss for the half year was £4216 8s. 2d., which, added to the amount brought forward, £1645 15s. 4d., after payment in May of the last dividend at the rate of 9 per cent. per annum, £3385 2s., and £247 1s. 4d. written off Mauá and Co.'s debt, makes a total of £5862 3s. 6d. available for dividends and contingencies, out of which the Directors propose to pay an interim dividend for the six months at the rate of 10 per cent. per annum, free of income-tax, amounting to £3817 10s., and to write a further 20 per cent. off the balance of Mauá and Co.'s debt, amounting to £197 13s., carrying forward £1847 0s. 6d. to the present half year. The Government has sanctioned the addition of 50 lamps to the public lighting; but, as yet, has only given definite orders for the erection of a portion of this number. The private lighting continues to show very satisfactory increase, and main-pipes are now on the way out for further extensions. The Gas Engineer reports the works to be in a very satisfactory state, the machinery and buildings in perfect order and repair, and that an additional coal store has just been completed.

WELLS AND RIVERS AS SOURCES OF WATER SUPPLY.

Owing, no doubt, to the persistent reference made in the Registrar-General's monthly reports to the excellence of the water supplied by the Kent Water Company from their chalk wells, and to the urgency with which this view of the superiority of well water has been insisted on in the reports from time to time published by the Commissioners on the Pollution of Rivers, it has become usual with a large class of public men, as well as of the public Press, to speak of river waters as in their very nature unfit for purposes of supply, and to look forward to a near and happy future when well waters should everywhere replace them. It is true that some who thus speak, and perhaps write, have in their day been active in closing and removing from public use a large number of wells utterly unfit for supply. These, however, were wells only reaching shallow land-springs, into which sewage and the drainage of churchyards were allowed to enter. What is now recommended is water from deep wells, and practically the supplies are looked for either from the chalk or the new red sandstone. According to the estimate of Mr. De Rance, in the report of the Congress on Water Supply at the Society of Arts in 1878, there are in England and Wales 8759 square miles in which chalk is the rock geologically present, and 7431 square miles of triassic rock. If from this we deduct, say, one-fourth from the surface of chalk as being covered with clay and other diluvial matter, and one-third from the triassic rock as not permeable, we shall find that there is little more than one-fifth part of the island available for pumping, even assuming the condition of the strata to be everywhere favourable, instead of being everywhere doubtful. If we abandon the rivers and surface waters, this is the prospect that remains.

But let us fairly consider the case of wells as compared with surface waters. It is admitted that polluted water sinking into porous strata, and carried along even for a considerable distance through sand and gravel at shallow depths, conveys sewage matter freely, and remains totally unfit for supply. No horizontal limit to such conveyance has been suggested. It follows as a necessary consequence, and has been proved by experiment, that when the strata are porous and fissured, and water passes down into the rocks, the surface impurities must, in like manner, be carried down, and are liable to be conveyed by the flowing water through underground channels to any distance, subject only to such change by oxidation as would be the case with water flowing over the surface. So far as impurities discernible on analysis by the chemist are concerned, it must be clear that well water derived from the surface, and exposed to all surface impurities, and purified only by oxidation, is neither better nor worse than river water similarly circumstanced. Both are purified by oxidation, if sufficient time and disturbance are allowed; and, as a matter of fact, both show it in the same way, by a conversion of the nitrogen derived from animal matter present into harmless nitrates and nitrites. If, as we have been told on great authority, there exist poison germs, invisible to the most minute inspection under the microscope and undeterminable by the experienced analyst, there is not the smallest reason for supposing that any greater change can happen to them in their progress through the water channels in rocks than when floated down a stream. If they resist change in the one, they may in the other, and when brought to the surface by pumping through a thousand feet of strata, they are as liable to produce their effect as when carried quietly on the surface. So far as there is danger from the unknown and unseen poison germ, no advantage can arise from the use of well water in place of water carried along the surface.

If we refer to facts, we shall find that the number of large towns dependent on wells for their water supply is extremely small. The most important are Sunderland, Hull, Nottingham, Brighton, Norwich, and Croydon. All these towns have populations exceeding 50,000. But in addition to these six towns, the total population of which at last census was a little above 500,000, there are in England some twenty-five other towns, also with populations exceeding 50,000, and of which the total population is about 3½ millions, besides the Metropolis, in which an equal number of people (3½ millions) are supplied from the Thames. In none of these is well water the source of supply, but if all these great centres of industry are to be declared in danger because they do not obtain water from deep wells, we shall have to organize a system for replacing those reservoirs and other magnificent works which have been constructed within the present century for storing the upper waters of the rivers of Yorkshire, Lancashire, and elsewhere, by a system of wells, often at great distances from the large towns, and distributed over the surface

of the land wherever chalk or new red sandstone, or perhaps in some cases greensand and oolites are to be found. What is meant by this is perhaps hardly realized by those who advocate it. In the present state of our knowledge, there is no certainty of obtaining water by sinking into any strata. All the vast body of evidence accumulated in the experience of well-sinkers points to the utter uncertainty of success in any place, however favourably situated. The last examples in London and Liverpool are perhaps as instructive as any. In London, and the country near London, it has been clearly proved that no water is to be looked for in the deeper strata, and it is equally certain that the chalk is being drained, and the level of the available water under the London clay is becoming sensibly lowered. At Liverpool an attempt has failed which was regarded, with some reason, as an *experimentum crucis*. In the new red sandstone near that town—as, indeed, was indicated long ago in the course of a well-known inquiry under the superintendence of Robert Stephenson—the water obtained by exhaustive pumping from a deep well affects the whole of the rock for some distance, forming a cone of exhaustion whatever be the depth from which the water is taken, while the water thus removed is replaced from adjacent strata to which, when near, the sea has access.

It cannot escape notice that if, as thus proved at Liverpool, and well known from what has happened in almost every successful deep well sunk near the sea and subjected to exhaustive pumping, the water is affected by the vicinity of the sea, the pollution and sources of contamination conveyed into the strata from the surface where the rain enters must be equally capable of being conveyed. Can it be supposed that the effect of half a million of human beings occupying a few square miles of the surface of absorbent rock, as at Liverpool, can be so small as not to be injurious when sucked down continually and washed in by every rain, while the upper portion of the strata is drained by continual pumping of the water from underneath it? All the observations and experiments that have been made, prove beyond doubt that whatever the depth of a sinking may be, and however securely the walls of a well or boring may be tubbed, the water, when removed from below, will fill up from the surface. This being so, there are no means of excluding the surface impurities in the case of wells, as there are none in the case of rivers, lakes, and other surface waters.

What, then, is the conclusion to which we are forced? We must either admit that all flowing water is equally dangerous, and thus be reduced to the alternative of distilled water, or that all is equally safe provided the conditions, as shown by analysis, are not unfavourable. Removing the sensational and imaginative from the case, and left entirely to the facts, there is no doubt that waters supplied from rivers and surface sources may be, and in most cases are free from injurious matter. That they are so in the Metropolitan supply is clear from the monthly statements published on the authority of Dr. Frankland. These, if published alone, without the remarks with which they are accompanied, would enable all who are qualified to judge for themselves, and would not suggest to those who are prejudiced and only half qualified, mischievous conclusions not warranted by the facts.

THE SOCIAL SCIENCE CONGRESS.

(*Continued from p.* 582.)

On the fourth day of the Congress (Saturday, Oct. 4) the address of Mr. F. S. Powell, the Chairman of the Health Department, was delivered to an appreciative audience—the Bishop of Manchester presiding. Commencing with a reference to the progress made in sanitary knowledge during the present generation, he proceeded to describe the difficulty of securing proper attention to sanitary enactments in Parliament, principally due, in his opinion, to the subordinate position of the Health Minister, for so he styled the President of the Local Government Board. He described him as being overshadowed by the Home Secretary, and crowded out generally by the pressure for public notice of higher functionaries than himself. Into this ground of complaint it is scarcely necessary to follow Mr. Powell. The Local Government Board accomplish a vast amount of quiet unpretending usefulness, and the powers they possess are perhaps quite as extensive as public opinion is just at present ripe for. As the importance of sanitary questions sinks deeper and deeper into the public mind, those powers may be increased; but for any great development of governmental action in the field of sanitation, we should rather turn from Whitehall to the local authorities, and deprecate the centralization which the glorification of the Health Minister in the manner desired by Mr. Powell would almost necessarily imply.

Passing to rural sanitary authorities, the speaker approved of the election of guardians for three years, on the ground that the stability thereby gained would give the guardian more heart for his work, while the annual election of one-third would keep public opinion on the alert. It is to be feared that another generation will have to arise before rural guardians will stand or fall by their opinions on sanitary matters, except in so far as they immediately or solely affect the rates.

Mr. Powell then dealt with the question of noxious vapours and coal smoke in towns, citing the "weight of vitriol and sulphur" arguments, as usual. Going on to the registration of diseases, he advocated the publication of maps showing disease centres.

In reference to drainage, water supply, navigation, &c., he quoted the Lords Committee on Conservancy Boards when stating that, at the present time, there are in operation in relation to these matters between 2000 and 3000 Private Acts, every one of which probably conflicts in some measure with public or private interests not within its scope. He advocated combination of districts and towns, wherever practicable, for purposes of water supply and kindred objects. He instanced the growth of the modern scientific spirit, as being of material assistance to the sanitarian; to which spirit, he might have said, the separate existence of the sanitarian, as a specialist, is primarily due.

In conclusion, he said: Everywhere, at every hour, change and decay govern animated creation. Perpetual dissolution of the old accompanies ceaseless resolution into the new. Such is the ordinance of Providence; but it is no part of His ordinance that these transformations should engender pestilence. How to control them, how to regulate the agencies which they excite, so that the waste of one process may become, without inconvenience or injury, the parent of new life-giving power, is the great physical problem of humanity. To solve it, and set at work the means of its solution, calls for constructive skill in the Cabinet, knowledge in the Legislature, educated and well-directed force in the Provincial Councils. The problem demands an activity as restless as the energies of Nature herself, and summons to a contest which can never end until creation itself becomes still and dead. To take part in this contest is a function worthy of the best, and not beneath the most exalted office of the highest.

The Bishop of Manchester complimented Mr. Powell on his address, and after mentioning his disinclination to consume so much vitriol every day as appeared inevitable for an inhabitant of Manchester, according to the statistics quoted in the address, he said it was a hopeful sign, for ourselves and for posterity, that we were no longer content to ignore sanitary problems, or to attempt their solution by rule of thumb, but were steadily moving on, and as we were already so much better off than our forefathers, we might hope that things would be better still for those who would come after us.

Dr. Stevenson Macadam, of Edinburgh, read a paper on domestic water supply, which was conspicuous for common sense, and in general character was particularly suited to the popular side of the Congress. He denied that the saline and organic ingredients in natural waters are necessarily impurities, and that their absence is to be particularly desired on that account. There was, he admitted, a decided advantage in the use of soft water for cooking or cleansing purposes. The presence of living organisms in water was unavoidable, when it was exposed to the air, especially in houses and during the summer months. He showed the fallacy of the common notion that soft water attacks lead pipes, &c., more than hard, as that action depended entirely upon peculiarities of the constitution of water, with which its comparative hardness has nothing to do. Hilly districts, he said, generally yielded soft water, from the fact that they were usually pastoral in character, and the rain passed away from them after less contact with soluble salts, while the converse held good in flat countries. He did not object to slight peat discoloration, which was quite harmless. Of course, he laid stress on the necessity of attending to the periodical cleansing of house cisterns. Captain Galton pointed out that domestic filters are apt to be domestic nuisances, and that without great care they cause greater pollution than they remove. In this opinion Dr. Macadam concurred, saying that as long as the drinking water passed through a filter, people generally were perfectly satisfied. In fact, he did not at all approve of filters in houses, for they frequently did more harm than good. He preferred slate to lead cisterns, and objected *in toto* to zinc, and also to earthenware unless glazed with salt.

The question of national water supply received a fair share of attention on the fifth day (Monday, the 6th inst.), and papers were read and discussed from the two stand-points of combined and independent action. Mr. A. T. Atchison advocated the division of the whole country into districts and sub-districts, as suggested at the Society of Arts Conference. Professor D. T. Ansted did not see that any extraordinary provision was necessary for small communities, which might very well do with the simple methods of supply which they had at present, provided it was protected from contamination. He pointed out that the ingredients technically called impurities are really of little consequence in their influence on health, and that dead organic matter is soon oxidized into harmless salts. In this he supported Dr. Macadam, and the combined testimony of these two experts was eminently reassuring to the nerves of persons who had been startled by the doctrines of those ultra-purists whom nothing short of absolute H_2O would seem to satisfy.

Mr. J. F. Bateman, C.E., had prepared an interesting paper on the Manchester Water-Works, tracing the history of the public water supply of Manchester from the undertaking of Sir Oswald Mosley, who brought water from the River Medlock into the town, down through the era of the Stone Pipe Company, to the establishment of the Longdendale works, and thence to the projected Thirlmere scheme, the ill-considered opposition to which, based chiefly on a fancied indifference on the part of its originators to the beauties of landscape scenery, seems to have died out, except in a few eccentric individuals who appear to think that beauty and utility can never be united without the instant destruction of the former.

The subject of tree-planting in towns was the attraction in the Health Section on Tuesday, the 17th inst., and the attendance was fairly good, several ladies taking part in the discussion, and making up for their previous neglect of the section by the fervour with which they aired their notions, and instructed their auditors in matters, the rudiments of which the majority might have been pardoned for believing that a life-long experience had already taught them. But it was just one of those subjects in which a laudable sentiment, depending on an innate love of nature, finds unexpected support from absolute science, and the border-land thus created between fancy and fact is very tempting to discursive individuals, who think they are talking science, when their thoughts are more upon gardening. It was fairly established that the aroma proceeding from the essential oil of the eucalyptus and pine is valuable not only in the prevention of pulmonary complaints, but destroys malaria, and thus the health of low-lying damp spots is materially improved by planting these trees, provided they can be induced to grow. Miss Becker showed her appreciation of gardening in her admiration of Ardwick Green, but spoiled a sensible speech by denouncing the Manchester Corporation Gas-Works as the cause of the greater part of the smoke and chemical vapours which overhang Manchester like a pall, and kill plants as well as darken the lives of men. Miss Becker ought, for the sake of her reputation for manly common sense, to have made sure of her facts before founding sweeping allegations upon them—allegations which, if true, ought to form the basis of an indictment at law. As a matter of fact, it is sufficient, by way of refutation, to refer to the countless gas-works, in the United Kingdom and abroad, around and *in* which vegetation of the most delicate character flourishes luxuriantly. If the allegations were true, gas-works everywhere ought to be surrounded with an arid, poisoned desert, like that surrounding the fabled Upas tree; but when one such can be discovered, and only then, will it be time to listen to such impassioned vapourings as those of Miss Becker, and others who follow her in this matter, in speaking authoritatively on subjects of which their knowledge is eminently superficial and imaginative.

In the next paper, which showed in striking figures the disproportionate rates of mortality between the rich and the poor, Dr. Drysdale, of the Metropolitan Free Hospital, stated that the children of the affluent and professional classes died at the average rate of 80·45 per 1000, whereas the corresponding rate for the general population was 149·49 per 1000, the general results of the calculation of all ages showing that the average expectation of life among the well-to-do was 55, and among the poor but 35 years. This was again a grand opportunity for female oratory, Miss Helen Downing speaking of poverty as a cancer and the root of all evil, and she called upon the section to remove the difficulty. How it was to be done the speaker did not indicate so clearly as could have been wished. It has been said that the poor we have always with us, and probably this state of things will continue in spite of Social Science Congresses. Miss Becker considered large families a deplorable evil—a perfectly natural sentiment under the circumstances, but not to be considered as the sole cause of poverty and death. In stating that drink was not so much the cause of poverty, as poverty the cause of drink, she tried to fix the terms of a simple equation, which is completely transposable. How many people take to drink before they become poor, and how many are poor before they take to drink?

The business of the section concluded with a visit to the sewage works of the Health Committee of the Manchester Corporation in Holt Town. Here the multifarious operations necessary for disposing of the contents of between 70,000 and 80,000 house-pails daily, were seen in full swing. The works are probably the most complete and extensive of their kind in the world, transforming the sewage and sweepings of the city into numberless useful kinds of material. Everything necessary for the works—waggons, sacks, tools, &c.—is made on the premises, and Mr. Whiley, the energetic Superintendent, is engineer, architect, builder, and manure manufacturer at the same time. About 350 men are employed under him, besides women, turning out 400 tons of marketable manure weekly. Glass, paper, and rags, scraps of iron and tin-ware are sorted out of the sweepings, and many fowls and ducks find savoury food among the refuse. Nothing is wasted, and the whole establishment goes on with the clockwork regularity of an old established factory, instead of the mushroom growth which it really is. It seems a pity that with all this expenditure of money and trouble, only the fringe of the great question is touched, and that Manchester is looking forward, not without dread, to the imminent work of main drainage necessary for the disposal of that matter which is not to be intercepted by pails, but which is none the less sewage in every sense of the term. Rochdale, from which the pail system was copied, has made the plunge, and Manchester must follow with an expenditure compared with which the cost of the Holt Town works will appear trifling.

This concluded the sectional business of the Congress.

The Water Supply of Bridgwater.—The Bridgwater Water-Works are now so nearly completed that the Mayor (Mr. Holland) was on Monday last week enabled to turn on the water from the impounding reservoir into the first filtering-bed, and it is expected that in about a week hence the water will be running in the mains laid throughout the town.

Explosion of Gas at Brecon.—About five o'clock last Friday afternoon an explosion of gas occurred in St. Mary's Church, Brecon, whereby great damage was done. It appears that new gas-pipes were being laid in the church, and during the testing of the joints the explosion took place, no doubt owing to a plug being left out where the pipes had been severed. The greater portion of the north aisle was wrecked, and all the windows were shattered. A fine stained-glass window in the chancel is completely destroyed, and part of the roof was blown off. The damage is estimated at upwards of £1000. Happily no one was injured.

Communicated Articles.

ON THE EFFECTS OF THE CONTACT OF TAR WITH COAL GAS.

By Mr. R. H. Patterson, F.S.S., late Metropolitan Gas Referee.

Part II.

When Mr. Young and his brother-in-law filled a gas-meter with "intermediate paraffin oil," and beheld the sudden diminution—almost destruction—of the illuminating power of the gas, they were greatly surprised. It was to Mr. Young a discovery; and for himself individually he deserves as much credit for it as if the fact had never been intelligently observed before. Moreover, as regards the general knowledge prevailing among gas managers, it really was equivalent to a discovery. Mr. Cusiter was a most able and intelligent gas manager, and he shared the surprise of Mr. Young, whose paper, also, was accepted by the gas world at large as throwing new and valuable light upon this point.

Nevertheless, no sooner did Mr. Young make public his discovery, than it was shown that the said action of "intermediate paraffin oil" had been long employed for the purpose of absorbing illuminating gas. In two letters to the Journal (Oct. 3 and Nov. 7, 1876), Mr. Calderwood, of the Addiewell works, West Calder, stated that intermediate paraffin oil had been employed in these works for the recovery, by absorption, of the volatile hydrocarbons diffused through the waste shale gases, for no less than nine years previously. As both Mr. Young and Mr. Calderwood appear to be engaged in the same kind of business—viz., the production of oil from shale—it seems strange that Mr. Young should not have been aware of the effect of this intermediate paraffin oil upon illuminating gas. But there are few things more common in ordinary business than that a "rule-of-thumb" process may long be successfully employed without the chemical or other principles involved in it being intelligently observed; so that such a process may be in use without its general qualities and its applicability to some other branch of business being observed.

The fact stands clear, however, upon Mr. Calderwood's statement, that the use of a particular kind of oil ("intermediate paraffin oil") had been practised at the Addiewell Shale Works for the nine years previous to 1876—that is, since 1867. Whence the idea was derived, is not stated; and possibly it may have arisen from simply observing the effects which take place during the distillation of shales. But the year 1867 was a memorable one in this inquiry; for, in truth, in that year all the valuable knowledge as to the effects of the contact between gas and its tar, which has recently been re-discovered, and which has deservedly attracted so much attention among gas managers, was clearly and scientifically set forth in a book the title of which is still familiar to the gas profession, but the contents of which apparently have become forgotten—viz., the Rev. Mr. Bowditch's book upon coal gas.*

This Tar Question is treated by Mr. Bowditch in his opening chapter, in which he strongly condemned the ordinary process of condensation. He says: "Hitherto, *principles of science* seem to have had but little connection with condensation. . . . There could be no more mistaken practice than the one commonly adopted"—the sole object of which is to cool down the gas to about the temperature of the surrounding atmosphere. "Most manufacturers of gas," he says satirically, "take the best means with which we are acquainted for removing hydrocarbon vapours from gas. . . . No suspicion seems to cross their minds that they are enabling the tar (*i.e.*, the heavier oils) to dissolve out from the gas, and carry down with it, the vapours of light hydrocarbons which they ought to retain in their gas with the utmost sedulity." He then proceeds to explain the nature and properties of the complex substance called gas tar, giving a table showing the chemical formula, boiling point, and specific gravity of each of its chief constituents.

Giving his own experience, he speaks first of the light hydrocarbons known as coal naphtha. These, he says, "have been obtained by the distillation of gas tar, and consequently have been separated from gas by the process of condensation now used in our gas-works. If gas be passed over this naphtha, it gradually disappears, and the gas which passes over the naphtha acquires considerably greater illuminating power than it possessed before." Then, speaking from the experiments made by Dr. Letheby in the City of London Laboratory, he states that 4 grains of naphtha added to a cubic foot of common London gas increased its illuminating power 25 per cent.; and 10·77 grains added to a cubic foot of the same gas increased its illuminating power 77 per cent. Mr. Bowditch then adds: "I never yet saw common gas which would not take up, and carry during its distribution, 4 or more grains per foot of suitable hydrocarbon vapour." In this way he demonstrates how much illuminating power was lost in the ordinary process of condensation, and how important it is that this loss should be prevented.

He then goes on to treat of the heavy hydrocarbons, and the principles which must be kept in view if the lighter hydrocarbons were to be retained in the gas. He shows that some of the heaviest hydrocarbons can be carried by gas in the ordinary course of distribution. He says: "I have obtained from the gas supplied to my house a quantity of oil so heavy (that is, of such high boiling point) that a Florence flask, in which it was dissolved, softened and partially lost its shape before the oil could be driven over. I never yet examined a sample of commercial benzole without obtaining naphthaline from it, though the latter boils at 410° Fahr., and the former at 176° Fahr., and I have no recollection of meeting with a sample [of commercial benzole] free from some portions of the less volatile

* "The Analysis, Technical Valuation, Purification, and Use of Coal Gas." By the Rev. W. R. Bowditch, M.A., F.C.S. London: 1867.

fluids, caproyle, cymole, &c." Since naphthaline, which at ordinary temperatures is a solid, has thus been found to be contained in the purest samples of commercial benzole, it is obvious that there must be a very strong affinity between the lightest and the very heaviest of the hydrocarbon vapours. Mr. Bowditch was of opinion that these substances do not merely dissolve in one another, but unite chemically, and that their separation cannot be effected without a carefully-conducted artificial process of "fractionating" the oils.

Now, in these passages of Mr. Bowditch's book we find literally everything which has been recently set forth. In the experiments which Mr. Young made before the North British Association of Gas Managers, he showed that purified or ordinary gas would take up naphtha over which it was passed, thereby acquiring a higher illuminating power; whereas, if passed over heavy oils, the gas would lose its illuminating power. Also, the still more interesting fact, which Mr. Young showed—viz., that the gas when passed over light oils, while absorbing them, deposits from itself a portion of very heavy oil—had likewise been found, and stated by Mr. Bowditch nine years previously.

Finally, as to the measures Mr. Bowditch suggested for preventing the loss of illuminating power which occurs in ordinary condensation, by retaining the light hydrocarbons in the gas. The thing to be effected is to prevent the naphtha vapours from being carried down by the heavy or tarry vapours, and deposited along with them. "If the whole products of the distillation are cooled down *quickly* to 60° or 70° Fahr., all or nearly all the substances condensable at that temperature will be condensed and removed from the gas, as fluids or solids, according to their habitudes." Obviously, there are two ways in which a remedy may be sought for—first, by endeavouring to *retain* the naphthas in the gas, *without its being deposited at all* along with the heavy oils in the hydraulic main and condensers; or, secondly, by recovering the naphtha after it has been deposited, and *returning* it into the gas under circumstances suitable for its retention. Mr. Bowditch offers a word upon both of these points. In order as far as possible to prevent the naphtha being deposited along with the tar, he suggests that the hydraulic main ought to be kept "at a proper temperature," and to be prolonged sufficiently to allow the less volatile bodies to condense and pass away to the tar-well, and the more volatile to go forward with the gas. Apparently, however, he does not place much reliance on this procedure; but he speaks very confidently as to the other process—viz., of *returning* the naphtha into the gas under suitable conditions for its retention. "Gas," he says, "at common temperatures, can take up and carry a considerable quantity of the vapour of the lighter hydrocarbons, *if they be brought into contact with it after having been separated from the heavy ones.*"

The words in italics (and they are italicized by Mr. Bowditch himself) contain the pith of the matter. The naphtha, or light hydrocarbons, will be readily absorbed provided they are presented to the gas separately, and provided the gas be previously condensed or purified from the heavy hydrocarbon vapours. In proportion as the gas remains charged with the heavy vapours, it is unable to absorb the light ones; and, of course, it is useless to present and attempt to return the naphtha into the gas while the gas is still depositing its heavy vapours. Also, it is useless to attempt to make even purified gas absorb or lick up naphtha from the tar (in which it is united, if not chemically combined with the heavy oils), because the naphtha has a stronger affinity for the tar or heavy hydrocarbons than it has for the gas—indeed, the tendency of such a contact is, not for the gas to take from the tar, but for the tar to take from the gas, with a proportionate diminution of the illuminating power.

On the other hand, as already said, the absorption of the naphtha takes place readily if it be presented by itself to gas which has been freed from the tar. And it is easy enough to do this by a separate and special process; but this is simply to "carbonate" the gas, such as has often been done in various forms. The real difficulty and the great point to be attained is to accomplish this object *in the course of gas manufacture*, by conducting the process of condensation in such a manner that the heavy vapours will be deposited by themselves, while leaving the highly volatile hydrocarbons in the gas.

In the quotation which I have made on this point, Mr. Bowditch merely says that the condensers should be kept at a "proper" temperature, which is far too vague a term to be of service in so delicate a matter as this. But he fully recognized the all-important part which temperature plays in the matter, and the results of the experiments upon the effects of temperature which he mentions are alike interesting and valuable:—First, as to the power of purified gas to absorb even comparatively heavy hydrocarbons; he says, "I have passed gas at *common temperatures* over hydrocarbon oils boiling at from 220° to 280° Fahr., and the whole was taken up." But this is not a point of practical interest to the gas manufacturer, because these heavy hydrocarbons would certainly be deposited again—at least, all but a very minute portion, such as Mr. Bowditch says will often be found in distributed gas; and which, as Mr. Young says, it is highly important to get rid of. Next, as to the important difference which temperature makes upon the effects of the contact between ordinary gas and tar, Mr. Bowditch says, "I have passed gas through *heated* heavy coal oil boiling about 400° Fahr., and have found its illuminating power identical with its illuminating power before it was passed through the oils. It gave up nothing to them, and it took up nothing from them." Whereas when he passed gas through the same oils at *ordinary temperatures*, he found the illuminating power reduced from 13 candles to only 1 candle. The *cold* oil had dissolved out of the gas nearly all its light-giving constituents. "This," he says, but with considerable exaggeration, "is imitated in a great measure in the present method of condensation," wherein "all the oils, water, and the gas are cooled together, and thus an opportunity is afforded to the heavy oils to dissolve out the light ones from the gas."

Finally, Mr. Bowditch was of opinion that the improved process of condensation, the *principles* of which he had thus laid down, would be found to have a beneficial effect as to that torment of gas manufacturers—naphthaline. "It seems probable," he said, "that the presence in gas of as much hydrocarbon vapour as the suggested process would keep in it, would enable the gas to uphold its naphthaline in a state of vapour, by diminishing the tendency of the naphthaline to crystallize."

In a concluding article, I shall show what is doing at present, as for some years past, to give practical shape to the knowledge and suggestions thus made public by Mr. Bowditch in 1867, and re-ascertained, and most ably illustrated by Mr. Young in 1876—together with the merits, so far as yet ascertainable, of the several kinds of apparatus designed for that purpose.

SULPHUR IN COAL GAS.

By "DELTA."

(*Continued from p. 541.*)

The outcry against sulphur in London coal gas resulted finally in a hard-and-fast line being drawn by Parliament, 20 grains of sulphur in 100 cubic feet of gas being the maximum allowed by the Metropolis Gas Act, 1860. Such a restriction, if rigidly enforced, would at that time have paralyzed the Companies. Gas purification had not been sufficiently studied to allow of definite rules being formulated for the abstraction of impurities, and chemical knowledge had not been brought to bear upon the processes employed, which varied according to the individual ideas of the managers at different works. Under these circumstances, the restriction of a 20-grain maximum could not be complied with, and the clause remained, in fact, a dead letter. Neither the Letheby nor any other apparatus was prescribed in the Act, as the instrument for ascertaining the amount of sulphur present; the Companies and the Local Authorities had the power of fixing between them the modes of testing to be employed from time to time, and could jointly agree to alter the maxima of ammonia and sulphur impurities. No penalties were enforced under the Act against the Gas Companies for excess of sulphur, although the maximum was constantly exceeded. The oxide of iron process continued to be employed as before the Act was passed.

So the matter stood until 1868, when the question of sulphur impurity again came before Parliament. The Committee before whom the case was argued wisely resolved to abolish the hard-and-fast line, and establish in its stead the system of Referees, who should investigate the matter, and determine from time to time the limits within which the Companies should keep their sulphur other than sulphuretted hydrogen, having regard to the progress of chemical knowledge, and to the facilities enjoyed by the different works of carrying out purifying operations so as to cause no nuisance. The Act came into operation in 1869, but for the first three years the Referees named no maximum for sulphur, and merely prescribed that the gas should be tested by a new instrument introduced by them, and the amount of sulphur recorded. Their unwillingness to prescribe a sulphur maximum led to the resignation of the old and the appointment of new Referees, who announced that they would fix a limit as soon as the necessary plant was erected by the Companies. The Referees justified their limit by appealing to the results of experiments carried out by means of the foul lime process. It had been satisfactorily established that foul lime—*i.e.*, lime which had been converted into calcium sulphide by the passage of crude coal gas through it—absorbed carbon bisulphide from the gas. It had, moreover, been shown that carbonic acid interferes with the reaction whereby the carbon bisulphide is fixed, and that unless the gas is previously freed from that constituent, the foul lime is useless as an absorber of the "other sulphur compounds."

The chemistry of lime purification being so far advanced, the Referees decided that it was their duty to fix such a high standard of purity as could be maintained by means of the foul lime process; but since the removal of the lime would be difficult to accomplish, in a crowded neighbourhood, without creating some nuisance, the Referees prescribed a lower maximum for urban than for suburban works. Since the autumn of 1872, the works under the jurisdiction of the Referees have employed the foul lime process; the sulphur has been successfully kept down, but the neighbourhood of all gas-works has suffered a revival of the horrors of "blue billy." From 1874 the limit has been lowered 5 grains, so that urban works have to supply gas containing less than 20 grains of sulphur in summer and 25 in winter, and the suburban works less than 15 grains of sulphur in summer and 20 in winter. The details of the foul lime process vary but little at different works. The chief differences occur in the distribution of the lime, and the modes employed in emptying the purifiers so as to prevent a nuisance. But lately much attention has been paid to "washing" the gas before it enters the lime purifiers, and these liquid processes give promise of great development in the near future.

Crude gas, as it leaves the condenser, contains, roughly, 1 per cent. of ammonia, 1 per cent. of hydrogen sulphide, and 2½ per cent. by volume of carbonic acid. The ammonia is not in sufficient quantity, therefore, to fix either the hydrogen sulphide or the carbonic acid singly; it divides itself between the two, in a ratio depending on its relative affinity for the two acids and on the quantities of them which are present. When reacting substances and the products of the reaction remain in the liquid or gaseous state, the change is not the effect of a simple exchange of atoms between the reacting molecules, or the effect of a simple union between two molecules, but it is the effect of a multitude of reactions, whereby the original

materials are continually reacting to form products, and the products so formed are continually reacting to re-form the original materials. Of course, when one of the products is a solid under the conditions in which it is produced, it separates itself from the other reacting molecules, and the chemical change, in so far as the formation of these insoluble molecules is concerned, is simple and final. For instance, when a solution of silver nitrate is added to a solution of sodium chloride, the metallic atoms in the two molecules change places with one another, and the insoluble silver chloride settles at the bottom of the vessel, and the sodium nitrate remains in solution. But when a solution of sodium bromide is added to a solution of potassium chloride, no change is observed to take place, and formerly it would have been said that no reaction took place between the two molecules. But now the constitution of molecules is no longer regarded as *statical;* it is known that molecules of like nature interchange atoms one with another, so that, as a great chemist has stated, "in an aggregate of like molecules, the apparent atomic rest is the result of the interchange of like atoms between contiguous molecules."

When sodium bromide and potassium chloride are mixed, an interchange of metallic atoms takes place, forming sodium chloride and potassium bromide. These products react in the same way to re-form the original materials, and the total result of these changes will depend on the relative rates at which the two reactions occur. But if one of the products is a solid, then it is unable to react with the other product to re-form the original materials, so that in time the materials are completely decomposed; whereas only partial decomposition takes place whenever the products are able to react, the mixture maintaining a constant composition when the number of decomposing changes is exactly balanced in a given time by the number of recomposing changes.

When ammonium carbonate and ammonium sulphide are mixed together in the liquid or gaseous state, an interchange of ammonium radicles takes place; but, of course, the mixture remains unaltered in composition. If now excess of carbonic acid and hydrogen sulphide were added, the exchanges would be complicated. Ammonia in presence only of excess of carbonic acid would pass from molecule to molecule of the acid, the *proportion* only of free to fixed carbonic acid being constant during a given time; similarly, in presence of excess of hydrogen sulphide, ammonia would pass from molecule to molecule, and the *proportion* only of free to fixed acid remain constant. In presence of an excess of both carbonic acid and hydrogen sulphide, ammonia passes from molecule to molecule of the two, the *proportion* only of ammonium carbonate and ammonium sulphide remaining constant. Let me try to make this matter clear by a simile. At a German ball the ladies change from partner to partner, owing to the superabundance of cavaliers, so that, at a given moment, the same number of men are always waltzing, but not the same individuals, for every man has to wait and take a partner by turns. In a similar way, the ammonia being in demand, is taken in turns by the carbonic acid and hydrogen sulphide. The illustration will also serve to show the effect of quantity and affinity on the distribution of the ammonia. In a German ball-room, where there are more military men than civilians, *cæteris paribus* more military men than civilians will be dancing at any given moment. This is the effect of quantity or *mass*. But, owing to a predisposing affinity for a uniform on the part of the fair sex, the same predominance of the military over the civil element would be observed even were the numbers present equal. This is the effect of *affinity*.

Ammonia has a greater affinity for carbonic acid than it has for hydrogen sulphide; in crude gas it meets with two and a half times as much carbonic acid as hydrogen sulphide. Therefore, by far the larger portion of the ammonia is found, at a given moment, in union with carbonic acid. Supposing the proportion of hydrogen sulphide in the gas were suddenly increased, the proportion of ammonium sulphide would also increase. It is thus evident that, if carbonic acid were continually bubbled through a solution of ammonium sulphide, the hydrogen sulphide would be driven off, and its place taken by the carbonic acid; and similarly, if hydrogen sulphide were continually bubbled through a solution of ammonium carbonate, the carbonic acid would be finally driven off, and its place taken by the hydrogen sulphide, in spite of the superior affinity of the ammonia for carbonic acid. My readers may remember an experiment which illustrates these facts, tried some time ago at the South Metropolitan Gas-Works by Mr. George Livesey. He drove carbonic acid from his furnaces through a coke scrubber, down which he allowed his ammonia liquor to trickle. The large excess of carbonic acid drove off all the hydrogen sulphide, and the liquor, when it came from the scrubber, contained ammonia only as carbonate. This carbonated liquor Mr. Livesey found would absorb hydrogen sulphide from crude coal gas, and he expressed his astonishment that a compound, the constituents of which had a strong chemical affinity one for the other, was decomposed by a substance having a *less* strong affinity for one of the constituents of that compound than had the other constituent which it replaced.

(To be continued.)

Bradford Corporation Water-Works.—At the meeting of the Bradford Town Council last Tuesday, the Water-Works Committee recommended the acceptance of a tender for the construction of a reservoir on Thornton Moor, and also for a conduit to convey water from the Oxenhope Valley into the new reservoir. The designs for this work have been prepared by Mr. Binnie, C.E., the Water-Works Engineer, and the contract price for the entire work is £132,300. This reservoir is to be for storeage for the high level service; another immense reservoir, to cost £200,000, being in progress at Upper Barden, for the low level supply. It was stated that it would be five years before the works were completed. The recommendation was agreed to.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE EFFECTS OF THE CONTACT OF TAR WITH COAL GAS.

Sir,—In your last issue there is an interesting article by Mr. R. H. Patterson, late Metropolitan Gas Referee, "On the Effects of the Contact of Tar with Coal Gas." I presume the effects are to be more fully set forth in his promised succeeding article, as the first is a kind of historical record of the somewhat discordant evidence of engineers who have tried experiments that, from their variance, produced uncertain results. I presume, however, from the tenor of the article so far, that Mr. Patterson has decided that to bring gas into contact with tar is injurious to the former, because the latter will absorb a part of its illuminating power. That he is right in this I feel certain, and a curious illustration came under my notice a short time ago.

I had erected one of my brush scrubbers for a gas company. It contained five brush drums vertically over each other, each in its separate compartment partly immersed in water. The action of the apparatus is, that pure water is run in at the top brush, and passes from one compartment to another till it reaches the bottom, the gas passing in the opposite direction. By some means—I know not how, and merely state the fact—tar had been run in instead of water. The purifying results were unsatisfactory, and it became my duty to ascertain why. I had a hole drilled to test the strength of the water in the top compartment, and a stream of tar issued. I found the same in the second, and in all the others.

This tar, you perceive, having, from its greater specific gravity, taken the place of the water, the brushes were revolving in it, and the gas was passing through the fibres covered with tar. The result was that, instead of ordinary tar, it was a beautiful black varnish that flowed—more like cannel coal tar—and so thin that it might have been used as black paint. The tar had licked out naphtha from the gas, and to that extent reduced the illuminating power.

Having confirmed Mr. Patterson, I wish now to state that it is only some gas engineers who allow the tar to "remain as long as possible in contact with the gas in the condenser." My own practice for 20 years has been to separate the tar as soon as possible, and with this object in view I erect a tar-tank at the end of the hydraulic main, and let the tar enter there direct, even providing another tank to receive the tar formed in the horizontal condenser led round the retort-house before the gas enters the vertical or finishing condenser.

I have always read with a very great deal of pleasure anything that Mr. Patterson has written, because I have invariably found the grain to predominate over the chaff, and the grain, when examined, I have found to be very good. At the same time, let us have things perfectly correct—a condition which I am sure Mr. Patterson also wishes.

George Anderson.

35A, *Great George Street, Westminster, Oct.* 16, 1879.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Oct. 15.

(Before Justice Bowen, *Vacation Judge.)*

In re Garnett *v.* the Corporation of Lancaster.

As reported in another column, the arbitration to determine the amount of damage done to plaintiff's land by defendants operations having been concluded, application was made this day on Mr. Garnett's behalf to set aside the submission to arbitration, and to stay proceeding with the arbitration.

Mr. Webster, Q.C., and Mr. Wright appeared for the Corporation; Mr. Higgins, Q.C., and Mr. Horace Browne for Mr. Garnett.

Mr. Horace Browne was proceeding to state that the Arbitrator in this case had declined to hear evidence of opinion as to the value of plaintiff's land taken by the Corporation, and that, therefore, he sought to abrogate the arbitration, and to restrain the Arbitrator from further proceeding, when

Mr. Webster called attention to the fact that under the Lands Clauses Act a submission to arbitration is irrevocable.

Mr. Browne thought that if his lordship heard what had occurred, he would certainly stay proceedings.

Justice Bowen asked why this was vacation business.

Mr. Webster said it was because the Arbitrator's power would expire on the 1st of November, and his learned friend was not in a position to consent to an enlargement.

Mr. Browne said that was so, because the arbitration had, in fact, already taken place.

Justice Bowen: But if nothing has been done further than hearing evidence, and both sides will agree that nothing shall be done till the second motion day next term, it is much better that this should be determined then.

Mr. Webster remarked that the Corporation must have the Arbitrator's award, and that must be given before the 1st of November, unless there was an extension of time.

Justice Bowen said that this difficulty could be got over by extending the time, and he would therefore order that the time for making the award be extended to the 31st of December, the whole matter to stand over to the second motion day in term, and the Arbitrator to have power to make an award if the motion should then be dismissed.

Horncastle Local Board Gas Supply.—The Horncastle Local Board, who obtained possession of the local gas-works under the powers conferred on them by the Horncastle Gas Act, 1876, have made application to the Local Government Board to grant a Provisional Order to partially alter or amend the Act, so as to enable them (1) to apply a portion of the revenue from the works in providing a reserve-fund; (2) to make provision for the investment, accumulation, and application of such reserve-fund, and the interest accruing thereon; (3) to exclude from the operation of section 3 of the Act, the 38th section of the Gas-Works Clauses Act, 1847; (4) to make provision with respect to the making of contracts by the Board for the purposes of the Act, and the effect of such contracts; (5) to provide that the accounts of the Board under the Act shall in future be made up to the 25th of March instead of the 31st of December in each year. Last Tuesday Mr. C. N. Dalton, one of the Inspectors of the Local Government Board, held an inquiry at Horncastle into the matter; and no objections to the proposal were made by any of the ratepayers.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

Lieut.-Col. Bolton, in his report to the Local Government Board, on the water supplied by the Metropolitan Water Companies during last month, says: "The state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good from the 1st to the 14th of September; it then became slightly turbid, and remained in that condition until the 17th, when it improved, and fined down, and was good until the 24th, when it became bad; and it continued bad for the rest of the month. The highest flood state of the river at West Molesey during the month was 4 feet 7 inches, and the lowest 1 foot 10 inches above the summer level, the rainfall at this place being 2·75 inches. The water in the River Lea was generally good during the month. (These remarks refer to the condition of the water previous to filtration.) The water at the intakes was generally in a better condition during the month of September than it was in the previous month, but the filtration of the water supply was again attended with much difficulty, in consequence of the recent floods, and more especially in the case of those Companies not having sufficient storeage capacity and impounding reservoirs to avoid taking in water when floods prevail. The water supplied by the whole of the Thames Companies was, however, clear and bright, and the filtration was efficient."

The Registrar-General publishes the following table in reference to the water supply of London during September. According to the returns furnished to him by the Metropolitan Water Companies, 139,492,637 gallons, or 633,779 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 245 gallons (111·3 decalitres), rather more than a *ton* by weight, to each house, and 34·5 gallons (15·7 decalitres) to each person, against 35·3 gallons during September, 1878.

Companies.	Number of Houses, &c., supplied in Sept., 1878.	Sept., 1879.	Aver. Daily Supply of Water in Gallons* during Sept., 1878.	Sept., 1879.
Total supply	549,726	568,857	137,639,505	139,492,637
From Thames	259,713	272,442	69,613,872	70,636,744
„ Lea and other Sources	290,013	296,415	68,025,633	68,855,893
THAMES.				
Chelsea	29,014	29,700	8,745,700	8,733,100
West Middlesex	51,110	53,062	10,063,903	10,624,685
Southwark and Vauxhall	81,575	87,821	24,198,933	24,947,304
Grand Junction	38,462	39,648	12,171,836	12,120,355
Lambeth	59,552	62,211	14,433,500	14,211,300
LEA AND OTHER SOURCES.				
New River	127,267	128,837	29,205,000	28,912,000
East London	117,034	120,459	29,895,800	31,566,500
Kent	45,662	47,119	8,924,833	8,377,393

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for September, 1879, as compared with that for the corresponding month of 1878, shows an increase of 19,131 houses, and of 1,853,132 gallons of water supplied daily. The return from the Southwark and Vauxhall Company shows an increase of 6246 houses, and of 748,371 gallons supplied daily, compared with the return for September, 1878.

The following is Dr. Frankland's report on his analyses of the water supplied to London during September:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Tottenham, 1·3; Colne Valley, 1·4; Kent, 1·8; New River, 3·4; Lambeth, 4·1; Grand Junction, 4·3; East London, 4·6; West Middlesex, 4·6; Southwark, 4·7; Chelsea, 6·5. The Thames water delivered by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was rather less polluted by organic matters than in the previous month, and all the Companies filtered it efficiently. The Lea water distributed by the East London Company was no better than Thames water; but that sent out by the New River Company was of superior quality. It was efficiently filtered by both Companies. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for dietetic purposes; that of the Colne Valley Company, having been softened by Clark's process, was also suitable for washing. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear, very pale yellow; East London, West Middlesex, Southwark, Grand Junction, and Lambeth, clear and pale yellow; Chelsea, clear and yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	27·80	·341	·041	0	·102	·143	1·4	18·9
West Middlesex	29·90	·236	·033	0	·208	·241	1·4	21·8
Southwark	29·90	·216	·061	0	·221	·282	1·4	21·2
Grand Junction	29·22	·209	·013	0	·177	·220	1·4	22·1
Lambeth	31·26	·215	·025	0	·233	·258	1·5	21·5
Lea—								
New River	30·30	·152	·046	0	·263	·309	1·5	20·6
East London	29·44	·232	·039	0	·166	·205	1·5	22·1
Deep wells—Kent	45·70	·099	·009	0	·325	·334	2·7	29·0
Outer Circle.								
Colne Valley	14·20	·069	·012	0	·392	·404	1·6	6·3
Tottenham Local Board	41·50	·063	·011	0	0	·011	3·0	25·7
Corporation of Birmingham*	31·74	·278	·030	·002	·253	·284	1·7	18·4
Corporation of Glasgow†	3·04	·155	·009	0	·008	·017	0·65	1·11

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

BORING FOR WATER IN THE WHITECHAPEL ROAD.—The boring at Messrs. Mann, Crossman, and Paulin's brewery in the Whitechapel Road has just been brought to a satisfactory conclusion, the test pumping having failed to reduce the quantity of water in the bore-hole. The boring, which has been lined from top to bottom with 7-inch wrought-iron tubes, has been executed by the patented system of the Diamond Rock Boring Company. It was commenced in December, 1878, and is 12 inches in diameter at the surface. The strata passed through were surface earth, gravel, London clay, Woolwich and Reading beds, chalk, flints, grey chalk, and the green-sand was reached on July 19. The boring was continued 20 feet in this stratum, the diameter of the bore being 7½ inches. The water rises to within 105 feet of the surface, and its temperature upon examination was found to be 54° Fahr. Deducting stoppages, the time occupied in boring was 20 weeks. The work has been executed under the supervision of Mr. J. T. Jones, C.E.

AUCKLAND (NEW ZEALAND) GAS COMPANY.

The Seventeenth Annual Meeting of this Company was held on Thursday, July 31—Mr. C. J. STONE in the chair.

The SECRETARY (Mr. E. B. Parsons) read the report of the Directors, as follows:—

The business of the Company for the past half year has been sufficiently successful to enable the Directors to recommend the usual dividend of 7s. 6d. per share.

The new road on the reclaimed land has been formed sufficiently to allow of the completion of a new main direct from the works to Epsom, and by this means an ample supply of gas is now assured to all localities in that direction.

The length of mains laid during the past year is upwards of 6 miles. The number of consumers added to the Company's business is 186. The material of a new gasholder was received some time since, and arrangements are now being made for its erection.

With the view of promoting the use of gas for cooking purposes, the Directors resolved on the importation and sale of gas-stoves. This resolution was arrived at in April last, and the result has been so far gratifying. The Directors have the satisfaction of announcing that the introduction by the Company of the "Otto" gas-engine has resulted in the sale of several of these useful motors.

The Directors are desirous of recommending an early reduction in the prices charged for gas; but in view of the great outlay necessary during the next six months, and the overdraught at the Company's Bankers, they think such a step is not warranted in the present position of the Company's finances.

The Directors retiring by rotation are Thomas Macfarlane and Robert Mozley Stark, Esqs., who, being eligible, offer themselves for re-election. The Auditors also retire, in accordance with the Act, and again present themselves for re-appointment.

DR. *General Balance-Sheet, June* 30, 1879. CR.

Paid-up capital on 7871 shares at £5	£39,355	0 0	Expenditure on capital account—		
Premium on shares sold	6,274	2 2	Freehold & leasehold land, buildings, manufacturing & distributing plant and meters	£50,668	11 11
Profit expended on permanent works	3,256	5 1	Stock of mains, service-pipes, meters, tools, gas-holder not erected, and materials unemployed	4,161	0 0
	£48,885	7 3	Stock of coal and shale	2,073	2 0
Amounts owing by the Company	933	13 9	„ residual products	342	0 0
Bills payable	940	0 0	„ gas-stoves	10	12 6
Bank of New Zealand	2,023	7 4	Amounts owing to the Company	1,036	9 8
Dividends unclaimed	18	15 0	Debentures, reserve-fund investment	3,000	0 0
Reserve-fund, balance at credit thereof	4,130	0 0		£61,291	16 1
Profit and loss, balance at credit thereof	4,360	12 9			
	£61,291	16 1			

Profit and Loss Account, for the Year ended June 30, 1879.

Coals carbonized	£5,888	2 5	Gas	£14,817	18 9
Stokers wages	903	15 9	Residual products	1,877	10 3
Distribution of gas and meter inspection	148	18 0	Transfer fees	6	10 6
Water at works	23	14 0	Miscellaneous	8	1 0
Insurance	7	7 6			
Wear and tear	793	4 11			
Purification of gas	126	9 0			
General expenses—					
Directors and Auditors	250	0 0			
Salaries	1,059	10 0			
Stationery, printing, advertising, and stamps	185	13 6			
Petty cash	25	4 10			
Legal expenses	11	5 6			
Rent	257	2 6			
Rates and taxes	386	12 9			
Office furniture	2	8 9			
Interest	142	3 7			
Bad debts	29	19 0			
Balance carried down	6,468	8 6			
	£16,710	0 6		£16,710	0 6

Balance at credit, June 30, 1878	£3,720	9 3
Balance brought down	6,468	8 6
	£10,188	17 9
Less dividend declared July, 1878, on 7691 shares, at 7s. 6d. per share	£2,876	12 6
And interim dividend, January, 1879, on 7871 shares, at 7s. 6d. per share	2,951	12 6
	£5,828	5 0
	£4,360	12 9

The CHAIRMAN, in moving the adoption of the report and balance-sheet, referred to the extensions which had been made during the past year, and to the depreciation which the shares in the Company had suffered through the existing commercial depression, as well as through the scare raised by the electric light. This latter cause had now ceased to operate, and it only required a less stringent money market to make the shares an easy and good investment. He then alluded to the intention of the Directors to substantially reduce the price of gas to consumers (now the lowest in the colony), as soon as the state of their finances permitted.

Mr. R. KEESING seconded the motion.

Mr. STARK, in supporting it, referred to the increased consumption caused by gas-stoves and gas-engines, which, being a day consumption, did not increase their expense for storeage power. He urged the Shareholders to push the use of gas stoves and engines, and strongly recommended them. The Company had obtained a new gasholder capable of containing 125,000 feet, which would be fixed before next winter. The extensions during the year had been 11,192 yards, and there were 186 new consumers. They did not propose any further extensions, but they had ordered some street-lamps similar to those in use in London, to show how gas could be best and most economically used.

The motion was carried unanimously.

The Auditors (Mr. G. P. Pierce and Mr. T. L. White) were re-elected; and, on the motion of Mr. B. IRELAND, seconded by Mr. ASHTON, a cordial vote of thanks was accorded to the Directors, the Manager, and the other Officers of the Company.

The CHAIRMAN responded on behalf of the Directors, and the SECRETARY on behalf of the Officers.

A vote of thanks to the Chairman terminated the proceedings.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of this Company was held at the Terminus Hotel, London Bridge, on Monday, Oct. 13—Captain HEATHORN, R.A., in the chair.

The SECRETARY and ENGINEER (Mr. George Livesey) read the notice convening the meeting, and the following report and accounts were presented:—

Owing to the prevalence of cold and dull weather during the past half year, there has been the unprecedented increase of 14 per cent. in the consumption of gas, which is now becoming extensively used, not as an illuminant only, but also for heating, cooking, and manufacturing purposes.

The retort-house referred to in the last report is approaching completion. Your Directors decided to adopt West's improved system of carbonizing, whereby not only will the cost of making gas be diminished, but much of the heavy manual labour attending the old plan of working will be dispensed with.

A contract has been made for the construction of a gasholder-tank, to be built of concrete without clay puddle, similar to the last. It is to be 218 feet in diameter and 54 feet deep. This work is progressing satisfactorily. Large trunk mains have been laid to ensure a full supply of gas to all parts of the district in the coming winter.

The amalgamation of this Company with the Surrey Consumers Company has been satisfactorily arranged, its completion having been delayed owing to an objection made by the Board of Trade to the principle on which the terms were based, whereupon the Directors of the two Companies modified the scheme in accordance therewith. The terms now sanctioned are, as nearly as possible, equivalent to those originally proposed. The scheme, which dates from the 1st of July last, having been passed on by the Board of Trade to the Privy Council, only awaits the confirmation by order of the latter to become law. Arrangements are being made to connect the two districts, and your Directors feel confident that not only the Shareholders of both Companies, but the consumers in both districts, will be benefited by this amalgamation.

Your Directors, in accordance with the powers conferred upon them at the last meeting, have issued the £62,500 of debenture stock, bearing interest at 5 per cent., the first instalment of 20 per cent. being payable on the 1st of October, and the remainder at such intervals as may be found necessary, of which due notice will be given.

The conversion of the ordinary capital into stock has been effected.

The profit on the half year enables your Directors to recommend the full dividend o 11½ per cent., to which, under the sliding scale, you are entitled, leaving a balance to be carried forward to the credit of the next half year.

No. 1.—STATEMENT OF CAPITAL (STOCK) *on June* 30, 1879.

Acts of Parliament authorizing the Raising of Capital.	Standard Dividend. The Standard Price being 3s. 6d. per 1000 feet.	Paid up.	Amount not paid up.	Total Amount authorized.
5 Vict., cap. 79	10 per cent.	£200,000 0 0	..	£200,000 0 0
32 & 33 Vict., cap. 130	Do.	50,000 0 0	..	50,000 0 0
39 & 40 Vict., cap. 229	Do.	250,000 0 0	..	250,000 0 0
		..	£250,000 0 0	250,000 0 0
		£500,000 0 0	£250,000 0 0	£750,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
32 & 33 Vict., cap. 130	Debenture.	Not exceeding 5 per Cent.	Nil.	£62,500	£62,500 0 0
39 & 40 Vict., cap. 229	..	Ditto. 5 ditto.	Nil.	187,500	187,500 0 0
				£250,000	£250,000 0 0

No. 3.—CAPITAL ACCOUNT.

Dr. Cr.

To				By	Certified to Dec. 31, 1878.	Received since that Date.	Total to June 30, 1879.
To Expenditure to Dec. 31, 1878	..	£482,725 10 1		By Shares, at £50 each	£200,000 0 0	..	£200,000 0 0
Expenditure during half year to June 30, 1879, viz.—				Do., at £12 10s. each	50,000 0 0	..	50,000 0 0
New buildings and machinery in extension of works	£3,788 13 3			Do., at £12 10s. each	250,000 0 0	..	250,000 0 0
New and additional mains and services	7,525 2 0						
New and additional meters	421 11 7						
		11,735 6 10					
Total expenditure	..	£494,460 16 11		The shares have been converted into stock during the half year.			
Balance	..	5,539 3 1					
		£500,000 0 0			£500,000 0 0	..	£500,000 0 0

No. 4.—REVENUE ACCOUNT, *for the Half Year ended June* 30, 1879.

To Manufacture of gas—			By Sale of gas—			
Coals, including dues, carriage, unloading, and trimming. (See Account No. 9)	£39,904 14 4		Common gas (per meter), at 3s. per 1000 cubic feet	£77,119 13 9		
Purification, including £708 13s. 1d. for labour	1,464 19 0		Less discount	116 6 3		
Salaries of Engineer, Superintendent, and Officers at works	1,298 11 2				£77,003 7 6	
Wages (carbonizing)	9,806 18 7		Public lighting and under contracts (see Statement No. 11)		8,163 19 9	
Repairs and maintenance of works and plant, materials, and labour (including £3000 for replacement of disused gasholder)—less £134 6s. 3d. received for old materials	10,923 2 3					£85,167 7 3
		£63,398 5 4	Rental of meters			1,711 11 9
Distribution of gas—			Residual products—			
Repair, maintenance, and renewal of mains and service-pipes, including labour	£2,352 4 5		Coke, less £1563 3s. 6d. for labour and cartage	£17,371 13 6		
Salaries and wages of Officers (including Rental Clerks)	1,921 8 7		Breeze, less £244 7s. for labour and cartage	236 7 5		
Repairing and renewals of meters	643 6 11		Tar	5,296 15 3		
		4,916 19 11	Ammoniacal liquor	4,749 18 1		
Public lamps—					27,654 14 3	
Lighting and repairing		1,906 15 0	Rents receivable		155 6 6	
Rents, rates, and taxes—			Transfer fees		3 12 6	
Rents payable	£275 6 4					
Rates and taxes	2,076 12 3					
		2,351 18 7				
Management—						
Directors allowance	£900 0 0					
Salaries of Secretary and Clerks	821 17 6					
Collectors commission	1,761 11 4					
Stationery and printing	295 3 6					
General charges	537 10 0					
Company's Auditors	50 0 0					
		4,366 2 4				
Law charges		70 4 8				
Bad debts		642 0 5				
Superannuation-fund		139 12 0				
Gas Referees and Official Auditor		67 1 8				
Total expenditure		£77,856 19 11				
Balance carried to net revenue account, No. 5		36,833 12 4				
		£114,692 12 3	Total receipts			£114,692 12 3

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on deposits	£101 11 11	Balance from last account	£49,901 0 2
Balance applicable to dividend on ordinary share capital	57,703 11 6	Less dividend on ordinary capital for the half year ending Dec. 31, 1878	28,175 0 0
			£20,826 0 2
		Amount from revenue account, No. 4	36,833 12 4
		Interest on moneys on deposit	145 10 11
	£57,805 3 5		£57,805 3 5

No. 6.—RESERVE-FUND.

Balance on June 30, 1879	£21,291 13 0	Balance on Dec. 31, 1878	£20,961 8 6
		Interest on amount invested	330 4 6
	£21,291 13 0		£21,291 13 0

No. 7.—RENEWAL-FUND (LEASEHOLD.)

Balance on June 30, 1879	£10,730 15 2	Balance on Dec. 31, 1878	£10,564 0 10
		Interest on amount invested	166 14 4
	£10,730 15 2		£10,730 15 2

No. 8.—INSURANCE-FUND.

Balance on June 30, 1879	£13,114 12 7	Balance on Dec. 31, 1878	£12,991 5 7
		Interest on amount invested. £8114 12s 7d. invested in 3 per Cent. Consols. £5000 to be invested.	123 7 0
	£13,114 12 7		£13,114 12 7

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1878.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1879.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	12,508	50,487	55,951	64	6,980
Cannel coal	809	2,568	2,184	..	1,193
	13,317	53,055	58,135	64	8,173

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1878.	Made during Half Year (estimated).	Used in the Half Year (estimated).	Sold in the Half Year.	In Store, June 30, 1879.
Coke . *Chaldrons of 36 bushels.	3,080	76,542	20,204	58,742	676
Breeze do. 36 do.	983	4,637	1,250	3,613	777
Tar . Gallons	17,286	628,325	1,500	636,843	7,268
Ammoniacal liquor—Butts of 108 gallons, 8-oz. strength	4,516	12,636	..	13,499	3,653

* Under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made, partly measured in Gasholders.	Quantity Sold.			Quantity used on Works, &c., (partly estimated.)	* Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	593,508	45,276	514,131	559,407	5,500	564,907	28,601	4,312

No. 12.—BALANCE-SHEET.

To Capital—		
For balance, per account No. 3		£5,539 3 1
Reserve-fund—		
For balance, per account No. 6		21,291 13 0
Renewal-fund—		
For balance, per account No. 7		10,730 15 2
Insurance-fund—		
For balance, per account No. 8		13,114 12 7
Net revenue account—		
For balance, per account No. 5		57,703 11 6
Sundry tradesmen, for amount due for coals, stores, and sundries		9,255 16 4
Deposits by consumers		6,097 16 10
Property-tax account		38 5 6
Dividend account (outstanding)		79 9 1
		£123,851 3 1

By Cash at Bankers		£34,679 1 6
Amount invested in Three per Cent. Consols—		
Reserve-fund	£21,291 13 0	
Renewal-fund	10,730 15 2	
Insurance-fund	8,114 12 7	
		40,137 0 9
Cash in hand for freight, accounts, &c.		1,000 0 0
Stores in hand—		
Coals	£6,682 14 10	
Coke and breeze	361 17 0	
Tar and ammoniacal liquor	1,400 0 0	
Sundry stores	4,011 12 0	
		12,456 3 10
Accounts due to the Company—		
Gas and meter rental, quarter ending June 30, 1879	£31,997 19 9	
Arrears outstanding	1,104 10 1	
		33,102 9 10
For coke and other residual products		2,235 19 8
Sundries		240 7 6
		£123,851 3 1

The Chairman said: Gentlemen, I presume you will, as usual, take the report and accounts as read. I therefore move that they be received, adopted, and entered upon the minutes. In doing so, I shall make a few remarks on the state of the Company. The accounts show accurately our position, which is one of continued progress. The increase of our business has been greater than ever, and although this is probably owing to the long period of cold and dull weather through which we have passed, still sufficient evidence has been given to prove that the use of gas is extending in all directions, and for a great variety of purposes. To meet this we have well in hand an additional retort-house and a gasholder-tank. This tank is being constructed entirely of concrete without clay puddle. It is the largest ever built, and will, we hope, be one of the cheapest, notwithstanding that the ground in which it is being constructed is of a very unsatisfactory nature, and full of water. There has been considerable difficulty experienced from the inclemency of the season, but our contractors have been working with a will, and when anything has given more trouble than usual, they appear to have had the more energy in overcoming it. I feel also it is simply an act of justice to our coal contractors to state that during the long strike of the Durham miners in the spring, their contracts were more than faithfully performed, thus saving the Company from loss or inconvenience of any kind. A paragraph in the report refers to the amalgamation with the Surrey Consumers Gas Company. We are expecting every day to hear that a meeting of the Privy Council is to be held, at which the amalgamation will be confirmed, and thus have the force of an Act of Parliament. I feel that the Shareholders have the right to the most complete information on this matter, and as the terms finally arranged are somewhat different to those submitted to the Shareholders, I will endeavour to lay before you exactly what has been done. The original agreement between the Companies was as follows:—The Surrey Company were to share equally in the dividend with us up to 11 per cent., and were never in any case to receive more than that amount, and if at any time a larger dividend should be declarable on the whole or united capital, we were to take their share of such larger dividend as well as our own. The Board of Trade said that by this arrangement the holders of the Surrey Company's stock would have no inducement whatever to reduce the price below the figure—3s. 2d. per 1000 feet—which secured them the 11 per cent., whereas the Board of Trade wished the principle of the sliding scale to apply to the whole of the capital. If they had one fixed sum, and there was no inducement to them to reduce the price charged for gas any further, they would not fall in to the working of the sliding scale. The Boards of the two Companies then sought an equivalent for the original terms on a new basis, and they found it in the following arrangement:—Both classes of Shareholders are to share equally in dividend up to 10½ per cent., and beyond this figure one-half of any additional dividend that may be payable on the Surrey Company's stock is to be paid to the South Metropolitan Shareholders in addition to their own share of such extra dividend. The Directors considered this an equitable arrangement, and they believe the Shareholders will have reason to be satisfied with its working. I shall be glad to furnish any further information that may be required, after the motion I have submitted to the meeting has been seconded.

Mr. Hilton T. Jenkins, in seconding the motion, said he had great pleasure in congratulating the Shareholders on two paragraphs in the report of the Directors, because they were remarkably short, and related to the ordinary business of the Company only. The first was that there had been an increase of 14 per cent. in the consumption of their gas, and the second was that the profit of the half year enabled the Directors to recommend the full dividend of 11½ per cent. That was the substance of the report, so far as regarded the ordinary business of the half year to which it related. Nothing could be very much shorter, and the Chairman had also made a short statement to them. Those two circumstances induced him to congratulate them very much, for long reports and long statements were generally required when there was some unfavourable state of things to excuse or to apologize for.

The report was unanimously adopted.

The Deputy-Chairman (Mr. R. Foster) moved the declaration of a dividend at the rate of 11½ per cent. per annum for the half year ending the 30th of June last. In doing so, he said he was quite sure any one who had examined the accounts would feel that they, and the report for last half year, were eminently satisfactory. He certainly thought that the cold and very dull weather there had been, had helped them considerably in the unprecedented increase of 14 per cent. in the consumption of gas; but at the same time, when they heard of every trade being so very dull, it was satisfactory to know that there was one—the gas trade—which was not in that state. They were all aware of the death, since their last general meeting, of their late Chairman. They all knew how much interest he took in the Company, and he was quite sure they all felt that the Company derived great advantage from his work in times past. He died, as they were all aware, at an advanced age, and very much respected by those who were left behind.

Mr. Simpson Rostron seconded, with pleasure, the motion for the declaration of the dividend; and he did so the more readily because it was not only a good dividend, and one which, to use a common expression, had been satisfactorily and honestly earned, but which he thought there was very little risk of being diminished.

The motion was unanimously agreed to.

Mr. Riley said he desired to move a vote of thanks to the Chairman and Directors, and he was sure the Shareholders would pass it, agreeing with him that the affairs of the Company were well managed, as shown by the eminently successful working.

Mr. T. Garner seconded the motion, which was carried.

The Chairman, in reply, said: Gentlemen, in returning thanks for the way in which Mr. Riley proposed and Mr. Garner seconded this vote, I can only say that this Company, though not the oldest, has been, I believe, the most prosperous of gas companies. The officers, of course, have more to do with our affairs than any one else, and, with the system we have always adopted, and the people with whom we have business connections having held together with such unanimity, our organization has been so good that I think we shall always be able to show you the same great prosperity which we have to-day.

Mr. D. W. Ogg thought, before they separated, they should pass a vote of thanks to the Secretary and Engineer. In proposing the vote, he said he did not think the Directors would feel that he underrated their ability, but from his own knowledge he could say that such a Secretary, Manager, and Engineer as they had was entitled to their warmest thanks for what he had gone through.

Captain Dixon, in seconding the motion, thought the officers and staff should be included in the vote.

The Chairman, in putting the motion, eulogized the energy, tact, and talent displayed by the officers in carrying through the amalgamation with the Surrey Company, and expressed a hope that in anything the Company had to do with other Companies, that tact and talent would not depart from them.

The motion was carried unanimously.

Mr. Livesey, in reply, said he could not exactly apply to himself the too flattering remarks in which Mr. Ogg had proposed the resolution, but he could assure them that he appreciated the goodwill which had led that gentleman to propose the vote, and the meeting to support it in such a hearty manner. This was certainly rather an interesting occasion, because it was the last time that the old South Metropolitan Company would meet. When they met next April he expected that they would have a larger gathering, and half the gentlemen attending would be those representing another section of the then South Metropolitan Company. It was an interesting matter to him to feel that he had been with this Company all his life, and that now it was entering on a new stage. It had certainly been a prosperous Company, and he thoroughly believed that, united with others, it would continue equally prosperous. He hoped that the South Metropolitan would keep the lead of the London Companies, and he believed that the policy which was now being pursued would have that result. He must say, on the part of the staff, that from his brother, who was his assistant, downwards, the Company were thoroughly well served—that every man did his duty honestly and earnestly, and that to their exertions was due very largely the Company's success, the Directors being supported in all that they wished done by the hearty co-operation of all the Officers.

The proceedings then ended.

Reduction in the Price of Gas at Cheltenham.—The Directors of the Cheltenham Gas Company announce a further reduction in the price of gas of 3d. per 1000 feet, the price now being 3s. 4d.

MANCHESTER CORPORATION GAS SUPPLY.

The Appropriation of the Gas Profits.

At the Monthly Meeting of the Manchester City Council on Wednesday, the 1st inst. (see JOURNAL, *ante* p. 550), it will be remembered that, on the discussion of the Gas Committee's report, Alderman Curtis raised the question of the legality of devoting part of the gas profits to the payment for street lighting, instead of the whole to the improvement of the city, as required by Act of Parliament, and moved the following amendment to the resolution for the adoption of the report, the consideration of which was adjourned for a fortnight—"That as the surplus of the gas-rents and profits is, by Act of Parliament, to be applied towards the improvement of the city of Manchester, in such manner as the Council or the Committee thereof exercising the powers of the Improvement Committee under the several Acts or any of them shall think proper, and therefore cannot be applied to defray the expense of the supply of gas to the public lamps within the city, or the lighting and extinguishing of the same, the annual report and statement of accounts of the Gas Committee now presented be referred back to the Committee, with instructions to alter and amend the same by charging all the expenses connected with the supply of gas to the public lamps, and of lighting and extinguishing the same, to the city fund."

An Adjourned Meeting of the Council was therefore held last Wednesday—the MAYOR (Alderman Grundy) in the chair—when the discussion of the Gas Committee's report was resumed.

The MAYOR said he had received a note from Alderman Curtis, who was not able to be present, requesting him, with the consent of the Council and the seconder, to withdraw the amendment. Mr. Curtis proposed to raise the question again in a form to which no exception could be taken.

Mr. GOLDSCHMIDT, the seconder, said he was prepared to consent to the withdrawal of the amendment.

Mr. HARWOOD strongly objected to the Council giving its sanction to the withdrawal of the amendment, and insisted upon the general subject being considered by the Council, so that it might be disposed of at once.

Aldermen BENNETT, PATTESON, and MURRAY also objected to the withdrawal.

Alderman LAMB said he thought if he read the note he had received from Alderman Curtis it would help them to decide as to what course the Council would do best to take in the matter. The note was as follows:—"It has been suggested to me to withdraw the amendment I moved at the last Council meeting, and hereafter to raise the question of legality by giving a formal notice to do so. As my object in moving the amendment was with the view of ascertaining the legality, I have authorized the Mayor to withdraw the amendment, and hereafter will raise the question as suggested."

Mr. SOUTHERN held that the question involved was of such a nature that it could not be allowed to drop in the manner suggested. The legality of a certain course pursued by the Gas Committee had been called in question. The Committee were day by day doing that which was illegal, if Alderman Curtis's contention was correct; and the Committee were bound, for their own sakes, to place the matter beyond doubt as soon as possible.

Mr. GOLDSCHMIDT asked the Deputy Town Clerk to give his opinion on the point raised, and so to settle the matter.

The MAYOR said Mr. Talbot thought the question much too important a one to give an opinion off-hand, as desired. On the question of order, he (the Mayor) had to point out that the amendment could not be withdrawn without the unanimous consent of the Council, and as there was some objection to the withdrawal, the discussion would have to proceed on the general subject.

Alderman HEYWOOD reminded the Council of the arrangement made in 1868, under which the Gas Committee were to hand over to the Improvement Committee yearly a sum equal to a gross profit of 10 per cent. on the capital employed. Without coming to the Council for their consent, the Gas Committee, he held, were not authorized to spend the money, which would be a part of their profits, by paying for the entire lighting of the city. He did not think they had a right to spend the money in any other way than in that fair, commercial way in which a concern like the gas-works should be carried on. It appeared to him that the Committee had not the power to determine how the profits of their department should be expended, but that it was their duty to hand over the profits to the Council, in order that that body might place them in the hands of the Improvement Committee. He could see no other course open to him than to support the amendment.

Mr. J. A. BIRCH said the Council were asked to consider the legality of a question upon which the Town Clerk had been unable to give a definite opinion. If the Committee had done an illegal act, he asked why they had been permitted to do so. The estimates were placed before the Council, and they were allowed to pass without any provision for the lighting of the lamps; and what was their position now if it was said they were not to light the lamps free of charge? If they were to have £25,000 for the lighting of the lamps, who was prepared to pay it to them? The estimates for the year had been taken. All the money had been appropriated, and where was the £25,000 to come from? They might, if they chose, charge 1d. per lamp all through the city, and then, he supposed, they would put themselves in a legal position. He, however, hoped the Council would negative the amendment.

Alderman BENNETT said that Mr. Birch seemed to forget that the Gas Committee had united with them the functions of the Lamp Committee. He contended that the Committee had no right to dwindle away their profits by any such action as Mr. Birch had named. Years ago the price of gas was 5s. per 1000 feet, and an agitation was raised to reduce it, which resulted in the formation of a Gas Consumers Association, who became a very formidable body, and were able to control and influence the municipal elections. So many members were returned to the Council in favour of a reduction in the price of gas, that it became a consideration with the Gas Committee whether they should not take some steps in order to conciliate these gentlemen. Then, as now, it was said that the gas-works belonged to the ratepayers and not to the gas consumers. An understanding was come to between the Gas Consumers Association and the Gas Committee, that, in the first place, gas should be reduced to such a price as would satisfy the Association, with this limitation, that the ratepayers of Manchester should have a profit of 10 per cent., which should be devoted to the improvement of the city, whereas formerly the whole of the profit was devoted to the improvement of the city, and that the gas should be brought down to such a price that no more than 10 per cent. should be given to the Improvement Committee. That was the meaning of the resolution adopted in 1868. Matters had gone on very pleasantly from that time to the present; but now, in consequence of the reduction in the price of coal and cannel, and in consequence of the large amount received from residual products, which he thought had increased from £4000 to £30,000 or £40,000 a year, the profits had grown very considerably. The whole question required remodelling and placing upon another basis. In his opinion the unwise course which the Gas Committee had taken would lead to the formation of another Gas Consumers Association, who would endeavour to set the Committee right as to the price of gas. The profits had become so large that the Committee were obliged, in order to hoodwink the gas consumers, to see in what way they could expend them. Seeing that the price of gas at Sheffield had been reduced to 2s. 4d. per 1000 feet, he did not think that the gas consumers of Manchester would much longer submit to pay 3s. per 1000 feet. They would say, "Let us fall back upon the agreement come to in 1868, allowing the Gas Committee 10 per cent. profit." Anything beyond that belonged either to the gas consumers or, according to Act of Parliament, to the Improvement Committee. It certainly did not belong to the ratepayers, and ought not to be applied to relieve the city fund under present circumstances. He did not say that he should not be in favour of applying for an amending Act of Parliament, but the Gas Committee had so far proceeded *ultra vires* in this matter.

Mr. STEWART said he quite agreed that the profits of the Gas Committee should be devoted to the benefit of the ratepayers, and he held that this was done much more effectually in lighting the slums of the city than in spending the money in improvements made in parts of the city where there was no resident population, and where the benefit was wholly and entirely partial. He held that after the resolution of the 27th of April last the Gas Committee had simply done what they were told to do by the Council. Further, considering the way in which the Improvement Committee spent their funds—they had now invested in unoccupied land an enormous sum—he thought it would be far better to reduce the price of gas than to continue to make the Committee so handsome a yearly contribution.

Alderman GRAVE said he had taken some trouble to look into the Act of Parliament, and he had come to the conclusion that the Council had distinct powers to improve the city, and he contended that the lighting of the streets was an undeniable improvement.

Mr. SOUTHERN pointed out that if the sum of £25,000 spent in lighting the street-lamps was given by way of addition to the yearly contribution made to the Improvement Committee, it would, as "profits," be liable to a charge of £500 for income-tax. Further, he held that until the street-lamps were lighted it was ridiculous to talk of "profits." The present was an economical arrangement; the opposite would be the case if they reverted to the old course of procedure.

Alderman THOMPSON said that the Deputy Town Clerk had not yet formed an opinion as to the legality of the question raised, and he (Alderman Thompson) thought they should adjourn the discussion until his opinion was before them.

Mr. CROSTON said the Gas Committee had adopted this practice on a resolution passed without proper notice being given to the members of the Council, and therein had arisen the whole difficulty. He thought the Committee had placed themselves in a somewhat delicate position in agreeing to light the street-lamps free of charge; but, in his opinion, it would be better that the subject should now be allowed to drop, and, if thought proper, re-opened later, and discussed in all its bearings.

Mr. GOLDSCHMIDT urged that the Council were not in a position to vote on the question until they knew whether the practice of the Gas Committee was or was not legal.

Mr. HARWOOD said he had been amused to observe that although the Deputy Town Clerk, after a fortnight's consideration of the question, had stated that he was not in a position to give an opinion against the legality of the course of the Gas Committee, yet that Alderman Bennett and Alderman Heywood had settled the matter to their complete satisfaction, saying that it was illegal. He held that if there had been anything illegal in the course of procedure, it was the Council who did an illegal act in April last, and not the Gas Committee. The Gas Committee found that they were likely to have a large surplus at the end of the year, and with the view of assisting the ratepayers in the present bad times, they resolved upon relieving them to the extent of this £25,000 per year. The matter was brought before the Council, who adopted the action of the Committee, and now it was said that they had done an illegal act. The action of the Committee had given immense satisfaction, except to a few persons who were quibbling about a legal question which they could decide in two minutes, but which the Town Clerk could not decide after a fortnight's consideration. All he had to say further was that the Committee could afford to remit the £25,000, and to pay 10 per cent. to the Improvement Committee.

After some further discussion,

Alderman LAMB replied. He contended that the Gas Committee had neither broken faith with the public nor with the Council, and that they had not acted improperly or illegally. If they were to be found fault with, it was not for breaking faith with the public, but for allowing the Improvement Committee to kill the hen that laid the golden eggs, and to forestall their profits before they (the Gas Committee) knew what those profits amounted to. It was true that they had not adhered to the strict letter of the resolution of 1868, but they had only departed from it by allowing the Improvement Committee too much—by allowing them 10 per cent. upon borrowed money for new and distinct works which had no existence in 1868.

The MAYOR, as a member of the Improvement Committee, said the work of that Committee was of all others that which was most before the eyes of the ratepayers. The alterations which had been made for a number of years past in the streets of the city spoke for themselves; they had the concurrence of the press and the public, and they would stand any amount of scrutiny that might be given to them.

The amendment was then put, and negatived without a division; and the original resolution was carried.

SALE OF SHARES IN THE BROMLEY GAS CONSUMERS COMPANY.

Last Tuesday, 600 ordinary £10 shares in the Bromley Gas Consumers Company, being the first portion of the additional capital of £100,000, authorized to be raised by the Company's Act passed in the last session of Parliament, were sold by auction, at the Cannon Street Hotel, by Messrs. Baxter, Payne, and Lepper. The shares will bear a dividend of 7 per cent., subject to the sliding scale; the Company's standard price being fixed at 4s. 6d. per 1000 feet, while at present they are charging 4d. less.

The Auctioneers in their catalogue gave an interesting account of the progress of the Company. They stated that the Company were established in 1854 to take over gas-works then existing in private hands, the annual rental of which was about £700, whilst the price charged for gas was 9s. per 1000 feet. Originally the Company were limited under the Joint-Stock Companies Act, but in 1865 they obtained parliamentary power, and their operations have gradually but continuously increased, so that in 1869 the sale of gas was over 28 million cubic feet, and the gas-rental, notwithstanding the price had been reduced nearly 50 per cent., had reached more than ten times its original amount. The district of the Company lies within 9 to 12 or 13 miles of the Metropolis, and comprises part of Beckenham, Bromley, Bickley, Chislehurst, Hayes, and West Wickham, which are already supplied, as well as some adjoining parishes, to which, as yet, the mains have not been extended. It is amply supplied with railway accommodation by the South-Eastern and the London, Chatham, and Dover Railway Companies, and is being rapidly occupied for the erection of first-class villa residences, for which purpose a very large acreage is yet available. The existing paid-up capital of the Company consists of £17,500

of debentures; £50,000 of ordinary 10 per cent. shares; and £20,000 of 7 per cent. shares. The quantity of gas sold by the Company during the last ten years has been:—1869, 28,197,500 cubic feet; 1870, 32,315,300; 1871, 37,009,700; 1872, 39,286,100; 1873, 41,773,900; 1874, 48,112,000; 1875, 50,778,900; 1876, 54,928,700; 1877, 61,621,000; 1878, 68,605,300.

The whole of the 600 shares were sold at the following prices:—

30	at £13	5	each	realized	£397	10	0
10	„ 13	0	„	„	130	0	0
20	„ 12	15	„	„	255	0	0
20	„ 12	10	„	„	250	0	0
90	„ 12	5	„	„	1102	10	0
430	„ 12	0	„	„	5160	0	0
600 shares.				Amount realized	£7295	0	0

CARLISLE CORPORATION GAS SUPPLY.

The Ordinary Meeting of the Carlisle Town Council was held last Tuesday—the Mayor (Mr. T. Milburn) in the chair—when the accounts of the Gas Committee, for the year ending June 30 last, of which the following is an abstract, were submitted:—

Capital Account.

Total expenditure to June 30, 1878 (less annual depreciation)	£43,166	16	1	Balance—being net value of works	£56,465	7	9
Extensions during year ending June, 1879	13,298	11	8				
	£56,465	7	9		£56,465	7	9

Profit and Loss Account.

Stock	£6,991	10	6	Gas	£16,661	3	3
Coal, cannel, &c.	9,431	16	11	Coke	2,310	5	3
Salaries and wages	5,585	5	10	Tar, &c.	3,319	8	8
Meters, castings, &c.	17,845	0	3	Meters, castings, &c.	18,064	8	6
Rents and taxes	555	8	6	Stock, &c.	8,093	10	0
Trademen's accounts	1,570	8	11				
Bad debts	61	8	5				
Interest on bonds	433	13	0				
Balance—profit	5,674	3	4				
	£48,448	15	8		£48,448	15	8

Liabilities and Assets.

Loans	£10,000	0	0	Capital account	£56,465	7	9
Deposits, &c.	1,743	18	4	Stock	6,072	4	8
Sundry creditors	7,793	12	6	Gas and other accounts due	12,459	3	3
Balance	57,459	4	10				
	£76,996	15	8		£76,996	15	8

Appropriation of Profits.

Amount paid to Corporation	£2,000	0	0	Profits for year	£5,674	3	4
Amount expended in extensions	7,298	11	8	Balance	3,774	8	4
Amount set apart for interest on deposits	150	0	0				
	£9,448	11	8		£9,448	11	8

Mr. Forster (Chairman of the Gas Committee) moved—"That the sum of £2000, inclusive of the annual payment of £200, be paid over to the city fund from the profits of the gas-works during the current year, to be applied to such special purposes as the Council may determine." He remarked that he was sure it would meet the approval of all the members present. A little more could be spared, but under the circumstances the Committee did not think it judicious.

Mr. Palmer reminded the Council that £13,000 odd had been spent on extensions of the gas-works during the past year.

Mr. Stewart said the £2000 was to be applied to some special purpose.

The Mayor: And there was a sum of £1800 last year, besides the usual £200.

The Treasurer said there had always been £200 a year paid to the city fund from the gas profits ever since the fish market was pulled down.

Mr. Creighton said the intention of the Gas Committee was that £2000 should be devoted to some special object. The fact was, £800 was voted from the gas profits two years ago, *plus* the sum which the Corporation were bound to receive by agreement; there was also £1800 last year, and £1800 this; making a total of £4400, *plus* the interest—say £4500. Now, if they obtained another £2000 next year, that would be £6500. This was a substantial sum, and it was time the Council decided what they would do with it; and by the time anything was begun, judging from the rate at which they did business, the sum would probably have reached £8500. He suggested that a Committee might be asked to consider the subject, for the purpose of proposing some plan of applying the money. At present it was going into the city fund, where it was being swallowed up. There was no inducement to the Gas Manager to work away, if he saw his profits going to help the expenditure of the Health Committee.

Mr. Palmer agreed that the subject called for serious consideration. It was only some two or three months since they had a letter from their Banker, calling on them for money; and he ventured to submit, with the accounts of the present year before them, that the Gas Committee were now in a position to adopt a scheme whereby, in some such shape as a mortgage upon the works, the Council would be able to clear off the debt at the bank. The capital value of the works was between £70,000 and £80,000, and the only burden upon them was a mortgage of about £10,000; so that there was ample margin to enable them to do much more than clear the hands of the town of debt, and thus reduce the district rate to a very considerable extent.

Mr. Wilson asked whether they could mortgage the gas-works without obtaining a special Act of Parliament.

The Town Clerk did not think they could be mortgaged for the purpose.

Mr. Bendle concurred with Mr. Creighton that the time had come, or would shortly come, when they should decide on the special purpose to which the money should be applied; but it would be premature to do so then without notice.

The Mayor said, in talking of these votes from the gas profits, it was well to keep out of the calculation the £200 a year, which was a sort of fixed payment to the city fund. At present the money voted was going into the corporate fund. With regard to what Mr. Palmer had said, he did not think they could mortgage the gas-works to pay off the Urban Sanitary Authority's debt.

The Town Clerk: The Gas Act itself provides some limit with regard to the application of such sums as are voted. They are not to go towards the general expenditure of the Corporation, but to some special object.

Mr. Wilson said the Town Clerk told them they could not mortgage the works even for their own extensions, let alone for paying the debt of another body.

The Treasurer said the votes from gas profits were paid in to the capital account of the city fund, and that account was drawn upon for the butter market extensions, the enlargement of the police office, &c.

The Town Clerk: Those are legitimate applications of the votes.

Mr. Creighton said they were to go to some special purpose which the Council might determine, and the Council had not directed their application in this way.

On the motion of Mr. Creighton, seconded by Mr. Wilson, the consideration of the question was referred to a Committee composed of the Chairmen and Vice-Chairmen of the various Committees of the Council.

CONTEMPLATED PURCHASE OF THE WOLVERHAMPTON GAS-WORKS BY THE CORPORATION.

At the Meeting of the Wolverhampton Town Council, on Monday, the 13th inst.—the Mayor (Mr. J. Jones) in the chair—the question of renewing the contract with the Gas Company for the supply of gas to the public lights came up for consideration.

Alderman Jones (Chairman of the Streets Committee), in moving—"That the contract for the supply of gas for two years, from Sept. 1, 1879, be approved, and that the Town Clerk be and he is hereby instructed to affix the corporate seal thereto," said the contract had usually run for three years. On this occasion, however, it was proposed to enter into a contract for a shorter period, for the reason that many boroughs had been able to reduce their rates very materially by the purchase and management of gas-works. It had therefore become a question whether it would be desirable for the Council to take into consideration the purchase of the Wolverhampton Gas-Works. By fixing the contract at two years, ample time would be given for the thorough ventilation of the question, at the same time that a decision would not be too long deferred. He had collected one or two items of information on the subject, which he thought would be of interest to the Council. First of all he noted the great increase in the capital of the Company. In 1852 their capital amounted to £57,000; in 1866 it had risen to £90,258; and by 1878 it had so largely increased as to amount to £127,049. There had also been a very large outlay on plant, and he found that during the last three years there had been expended for new buildings and plant £13,088, and for new mains £3998, giving a total increase of £16,987 on capital account. With respect to the revenue account, he found that for repairs executed, new meters, and materials, the expenditure for the three years was £8531. When they took this in conjunction with the outlay on capital account, they would see that the Company were making vast strides as well as thoroughly keeping up their plant. Turning to the profit and loss account, the net balance earned by the Company, after paying the half year's dividend, was for 1876, £7025; for 1877, £8025; and for 1878, £8302. Pursuing the comparison still further, the profit after paying all liabilities, dividends, &c., was for 1876, £1523; for 1877, £2245; and for 1878, £2529. They would see, therefore, that the Company had at the present time a very prosperous undertaking, and the question was whether they as a Corporation could deal with such a Company's estate for the benefit of the town. Furthermore, he was informed that the Company had purchased a piece of land, upon which they were about to erect offices, at a cost of something like £10,000, and it might be said that they were extending their business in what might be called the "fancy line"—that was to say, in the direction of the sale of globes, chandeliers, &c. Another element to be taken into consideration was the remuneration to the Directors. In 1876 this item amounted to £526; in 1877 it was the same figure; and in 1878 it had increased to £656. Of course, it was only to be expected that gentlemen should be paid for their labour, but if the gas-works ever became the property of the town, the Corporation would manage them as they did the water-works, and the expense of a directorate would be done away with. There was no idea of dealing at all unfairly with the Company, but the purchase of gas-works by corporations was contemplated in the various Acts of Parliament on the subject, there being provisions for conveying over the property to corporations under certain conditions, and in many large towns such purchases had been made. Although the purchases had appeared costly at the time, they were found, in the end, conducive to the interests of the ratepayers.

Alderman Willcock, in seconding the motion, said he regretted very much that this matter had not been discussed long ago, and if a Sub-Committee were moved for to go into the matter, he would propose that an investigation should be made of the Company's accounts during the last six years. He believed the profits made by them justified a reduction in the price of gas.

The Town Clerk remarked that there had been a reduction from 2s. 9d. to 2s. 6d. per 1000 feet.

Alderman Willcock observed that it must be borne in mind that presuming the Corporation purchased the works, they, as ratepayers, would reap no benefit from it, because if they produced a profit of over 10 per cent. it fairly and rightly belonged to the consumers, and he remembered this point being forcibly urged when it was suggested that the Corporation should have their gas cheaper than the general consumers.

Mr. Walsh was glad that the subject had been brought forward, and said, if a Sub-Committee were appointed to go thoroughly into the question, not only the Council but the ratepayers generally would derive a benefit.

Mr. Hill could not see what benefit would accrue, even if they accepted the very flourishing statement made by Alderman Jones. If the Corporation acquired the gas-works, all they would be able to save would be the remuneration paid to the Directors. He thought it would be injudicious, now that they were committed to such a variety of enterprises, to bring into the hands of the Corporation another large manufacturing concern, and it would be unfairly taxing the members of the Council who might be called upon to serve on the Gas Committee. The Gas Company were not entitled to declare a higher dividend than 10 per cent. on the old capital and 6 per cent. on the new, and all the Corporation had to see to was that they did not spend on their extensions money that should not be spent. The reduction referred to in the charge for gas was not a real reduction; it was simply a reduction back again after the charges had been raised. They had had the price of gas low before, and now that the cost of coal had gone down the gas had simply reverted to its old price.

Alderman Bantock had one suggestion to make, and that was that they had not yet disposed of the electric light. He did not think it would be wise to be dabbling in a concern for supplying light which might, after all, be extinguished either in the way he had indicated or by some other illuminating process.

Alderman Major thought it was not desirable to purchase the gas-works at present. Alderman Jones had expressed his surprise at the great increase in the capital of the Gas Company, but the question which they as a Corporation were chiefly interested in was as to how that capital was laid out. Was it being laid out in making extensions outside the borough? The Council, as he had intimated, ought to look after the interests of the gas consumers, and not allow the Act of Parliament bearing on the point to which he had adverted to remain a dead letter.

Mr. Williams defended the Sub-Committee which had had charge of th matter, declaring that they had done their best, in their conferences with the Directors of the Gas Company, to get a reduction in the price of gas, but had not been successful.

The motion was then carried without a division.

THE PURCHASE OF THE NOTTINGHAM WATER-WORKS BY THE CORPORATION.

The last Meeting of the Nottingham Town Council was held on Monday, the 6th inst.—the MAYOR (Sir J. Oldknow) presiding—when the following report of the Water Committee was presented:—

The Water Committee beg to report that they have acted in conjunction with the Bulwell Forest Committee in carrying the Nottingham Improvement Act, 1879, through its various stages in the Houses of Parliament, until it received the Royal Assent on the 11th of August last. The clauses especially under the charge of your Committee were those relating to the transfer to the Town Council of the undertaking of the Nottingham Water-Works Company. The various stages of these negotiations have been reported to the Council. They need not be repeated. Suffice it to say that the ultimate agreement with the Company departed in no material particular from the bases already assented to. There are two or three points to which attention should be called.

The main features of the terms arranged are these: The transfer to take place on the 25th day of March, 1880; that is, at the close of the Company's current financial year. The Corporation to be entitled on that day to possession of the whole of the property of the Company, whether real or personal; uncollected water-rents; balances at Bankers or elsewhere; and all other its estate and effects. In short, the Corporation, on the 25th day of March next, step into the shoes of the Company. Before that date, however, and as a condition precedent to possession, the Corporation must give to every Shareholder in the Company a certificate showing that such Shareholder is entitled to receive from the profits of the water undertaking, or from the borough fund or general district rates, an annuity, for the year ending March 25, 1881, after the rate of 6¼ per cent.; for the year ending March 25, 1882, after the rate of 6¾ per cent.; and for the year ending March 25, 1883, after the rate of 7 per cent.; and afterwards, in perpetuity, an annuity at the rate of 7 per cent. on the capital invested. Further, the Corporation must pay to the Company a bonus of £20,000, and a further sum of £10,000 in lieu of the Company retaining any cash balances in hand at the time of the transfer. Out of these sums the Company have to provide all compensations payable to Directors, officials, and others, and relieve the Corporation from any liability in respect thereof. Subject to the payment of these compensations, the net amount is divisible among the Shareholders.

The Directors also insisted upon retaining the powers secured to them by their Acts, of issuing additional share capital to cover the costs of works in progress. At the time of the negotiations the share capital of the Company stood at £450,000. Your Committee could not comprehend the reasons which influenced the Directors to insist upon this term as part of the bargain, but they deemed it advisable to limit the amount to be issued to the total sum of £400,000. The Directors have already issued two parcels of new share capital—the first, comprising a batch of 300 shares, and the second 250 shares, of £50 each. These shares were, according to the arrangement insisted upon by your Committee, sold by public auction. As these shares would in the year 1883 bear interest at the rate of 7 per rent., and as the Council can borrow money at 4 per cent., it is evident that it would be a loss to the town to allow these shares to go in the open market at a sum that would pay the purchaser more than 4 per cent. Your Committee accordingly authorized the Chairman and the Town Clerk to attend the auctions, and buy in all the shares which should be sold under the price which your Committee deemed it expedient to give. 425 shares in the capital of the undertaking of the Company have thus been secured for the Council. Such shares can be extinguished or re-issued as may be determined hereafter; but in the meantime the money has been raised by loan, and can be re-paid as the shares are re-issued. Your Committee, however, believe that in the future management of the finances of the water undertaking it will be found more economical to raise the capital required by debenture stock, than by annuities redeemable only by consent, and then on payment of 25 years purchase.

Parliament is becoming unusually vigilant in demanding the ultimate redemption of all charges upon local rates and resources. The time for repayment of loans has been much shortened in recent times. Your Committee, therefore, have to report that both the Chairman in the Lords, and the Chairman of Ways and Means in the Commons, cut down the term of 100 years asked for by the Council to 75 years. With this term your Committee consider the Council should be content. For the purpose of extinguishing within that period the annuities created by the Act, and, failing that, for providing a sum of money of which the annual interest shall be equal to the annuities, it is incumbent on the Council to institute a sinking-fund. Your Committee were very desirous to obtain for the accumulations of this fund, which are not expended in buying up annuities, a choice of sound investments which should secure to the Corporation the same rate of interest as that which they are themselves obliged to give. Not only would the investment of this fund in Consols have been a most serious loss to the town during the long period of years wherein it may accumulate, but it would in the end have given an increased value to the annuities in the market, as it would be extremely improbable that the Council would have gone on many years losing the whole of the difference between the investment in Consols and the 25 years redemption clause. Sooner or later a re-adjustment of the terms of redemption would have taken place between the annuitants and the Corporation, and such re-adjustment would have given the advantage, to the extent probably of one-half per cent., to the annuitants.

Your Committee, therefore, had good cause for anxiety in respect of the clause providing for the investments of the sinking-fund in the manner proposed by them. This anxiety was much increased by their inability to quote any precedent for the clause, and the opposition of Lord Redesdale's counsel. With some slight modification, not affecting the spirit and object of the clause, your Committee were successful in carrying the clause as proposed. The difficulties of the case were at once seen by Lord Redesdale and Mr. Cecil Raikes, and your Committee acknowledge the readiness with which those distinguished officials assisted them.

The revenue of the water undertaking must be disposed of in the following manner:—

1. In payment of the costs, charges, and expenses of and incidental to the collecting and recovering of water-rents, and of the borrowing of money under the Act.
2. In payment of the working and establishment expenses and cost of maintenance of the water-works, and generally the expenses of carrying the Act into execution.
3. In payment of the water annuities.
4. In payment of the interest on the debentures, debenture stock, and annuity certificates under the Act.
5. In providing the requisite instalments or sinking-fund under the Act.
6. In improving and extending the water-works and the mains, and in payment of any charges or expenses for the time being payable out of the borough fund, or the district fund, or the general district rate, in respect thereof.
7. In such a manner as the Corporation think best for the improvement of the borough and the public benefit of the inhabitants.

Your Committee cannot finish their report without congratulating the town upon the close of the long and anxious negotiations for the purchase of the Water-Works Company, in which Sir James Oldknow, Knt., has, since his present mayoralty, played the most prominent part. The Mayor has been most attentive to the work of this Committee, and diligent in carrying out its resolutions. Your Committee feel that the Council is much indebted to him for his disinterested services. Your Committee also congratulate the town on the burying for ever of the source of an expensive and painful litigation. No doubt the Directors of the Company have secured for themselves very excellent terms, but they are such as your Committee believe your town can well afford to pay. In the end, your Committee hope that the acquisition of the Water Company will not only prove a boon to the town in a sanitary sense, but will become a successful commercial undertaking. The time may come when an enlightened public may demand from Parliament the transfer of water undertakings to local authorities on more reasonable terms; but your Committee are afraid that such a time is too far distant to enter with any practical effect into the operations of to-day.

Your Committee, on a review of all the circumstances of the case, are of opinion that the Council, in acquiring the undertaking of the Water Company on the terms recited, have taken a wise step in a prudent spirit. There is much important work yet to be done. The preparing and issuing the certificates for the annuities; the raising the moneys to be paid to the Company; the registration of certificates and mortgage bonds, and the transfers thereof; the preparation and execution of the deed of assignment, and the payment of the very large stamp duty imposed thereon; the defraying of the parliamentary costs so far as they affect the water undertaking; the arranging the details of transfer both as to the staff of the Water Company and the Corporation, and the alterations and modifications which must follow—in one word, the whole of the steps necessary to enable the Corporation to take possession of, and successfully carry on the water undertaking, must have immediate attention. Your Committee, therefore, advise that they should be continued as a Special Committee, with the enlarged powers that may be needed.

Alderman THACKERAY moved the adoption of the report, and also the re-appointment of the Committee until a new Committee was appointed in November in the ordinary course.

This having been seconded, was carried, and the Council proceeded to other business.

REDUCTION IN THE PRICE OF GAS AT CIRENCESTER.—At Cirencester the price of gas has been reduced to 4s. 2d. per 1000 feet.

GLASGOW WATER SUPPLY IN 1859 AND 1879.

As may possibly be remembered by our readers, one of the greatest water supply undertakings of modern times, one involving the tapping of a large mountain lake in the heart of the Highlands of Scotland—the classic Loch Katrine—situated at a distance some 34 miles from the area of supply, was formally inaugurated on Oct. 14, 1859, by Her Majesty the Queen, for the benefit of the great community constituting the city and suburbs of Glasgow. It was on that occasion that the Queen and the Prince Consort first saw any large body of the Volunteers in uniform; somewhere about 250 of them, who had just then been embodied and recognized by the War Office, having constituted Her Majesty's guard of honour on the side of Loch Katrine when the interesting ceremony took place. By way of celebrating the twentieth anniversary of that rather notable event, a large number of the gentlemen who acted as the body-guard met at a semi-public dinner, last Tuesday evening, in St. Enoch Station Hotel, Glasgow, under the chairmanship of Captain William Mactear, the senior captain of the citizen army in Scotland. Several interesting speeches were delivered in the course of the evening, but what most concerns our readers is a summary of the remarks made by

Mr. JOHN MAYER, who chose as his subject a comparison of the water supply of Glasgow in 1879 with that of 1859, some particulars regarding which had been furnished to him through the kindness of Mr. J. M. Gale, the Engineer to the Glasgow Corporation Water Commissioners, and which he thought were specially appropriate to the occasion. The speaker briefly referred to the water supply schemes of Manchester, Liverpool, and Edinburgh; and coming to deal more specially with the Glasgow water supply, he went on to state that the cost of the Loch Katrine Water-Works, including all charges, was £920,000; but since the year 1859 there had been additional pipes laid across the valleys between Glasgow and Loch Katrine, and about 150 miles of additional mains had been laid within the area of supply, the cost of which was £443,000—the total expenditure up to the present being £1,363,000. But in the year 1859 the population supplied with water from the works of the two pre-existing Water Companies was 420,000, whereas the population throughout the water supply area has now been increased to 757,000, or well-nigh doubled. Prior to the opening of the Loch Katrine works the daily supply was 16,000 gallons, but the supply now stands at 37,740 gallons per day; and while the consumption in 1859 was 40 gallons per head of the population, it has now amounted to 50 gallons per head. The domestic water-rate within the Municipality was 1s. 2d. in the pound of rental twenty years ago, but now it has been reduced to 8d. The portion of the city lying on the south side of the Clyde, which was then supplied with water from the Gorbals Gravitation Works, was specially favoured in the Glasgow Act, the domestic rate being fixed at a maximum of 1s. per pound of rental. Both south and north suburbs outside the boundaries are now charged a uniform rate of 11d. per pound of rental. Water was sold by meter at the rate of 4s. 8d. per 1000 gallons twenty years ago, when the annual revenue for manufacturing and trade purposes amounted to £11,000, whereas the rate is now only 4d. per 1000 gallons, and the revenue has risen to £42,454 9s. 7d., or increased nearly fourfold. Again, the total annual revenue from all sources was £68,497 9s. 7d. prior to the Loch Katrine supply being rendered available. Now, however, it has more than doubled, the last returns being £140,231 6s. 5d.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(*Continued from page 596.*)

Mr. D. BRUCE PEEBLES (Edinburgh) read the following paper on

CONTROLLING THE SUPPLY OF GAS FROM THE GASHOLDER TO THE BURNER.

In a paper I read some years ago before the Royal Scottish Society of Arts, Edinburgh, I gave a table showing the great loss incurred by gas companies through leakage, when pressure in the gas-main is not under proper control; and in a paper read before the same Society last April I showed how the illuminating power of gas is destroyed by burning it at even what might be termed no very heavy pressure. In the first instance the loss is sustained by the gas company, in the second by the consumer; so that pressure, like fire or water, is a useful servant, but in all cases a bad master. In gas manufacture and gas distribution it is a great enemy to economy, and meets the gas manager in the very first stage of his working, hindering the production of gas, and favouring the production of carbon in the retorts. The exhauster gives thorough control here, doing for the retorts what the ordinary governor does for the mains, relieving them of pressure, and helping largely in the economy of the first and most important part of the operations of a gas company—viz., the manufacture of a useful and saleable article with certainty and at a low price. Within the gates of a gas-works the engineer, the architect, and the chemist have a wide field, which is being more and more worthily and successfully covered. It is no very uncommon thing now-a-days to find these three professions well represented by a gas engineer, and it is the one who can bring these three qualifications to bear upon the buildings, apparatus, and operations of a gas-works, who will fill his holder with the best and cheapest gas, and must, therefore, be considered the best gas maker even although a heavy percentage may be lost by leakage through imperfections in the distributory system. It cannot be particularly pleasant to the successful gas maker to find that 10, 20, and even 30 per cent. of what he has made is to be lost to him by leakage. He has the bird in his hand, and yet it flies away after all his care in caging it. To prevent this, and get the least amount of leakage and the greatest illuminating power, he requires to have a thorough means of controlling pressure from gasholder to burner.

I need not take up your time with descriptions of gas governors you are all so familiar with now. I shall, therefore, only call your attention to one or two forms, one being the governor invented by Goldsworthy Gurney, the distinguishing feature of which is that the bell and the valve are of the same diameter. I shall allude to this more particularly afterwards.

The large size demanded for the bell of the ordinary station governor is necessary to counteract the action of the inlet gas on the bottom of the valve, and also to obviate the tendency of the governor to get into a state of pulsation or bobbing, which often comes on unexpectedly and unaccountably. From long and repeated observations, I have come to the conclusion that these pulsations have a certain relation to particular stages of the delivery of gas through the governor. The pulsation is always most ready to take place when the delivery is small. On increasing the flow of gas, by opening burners, steadiness will set in, and continue until at another point a particular state of equilibrium is arrived at, which again sets up the pulsating movement. I have been inclined to think that there is some analogy between this phenomenon and the vibratory motion of the string of a musical instrument. At the nodal points of the string there is an absence of vibration, while further on vibration takes place, and continues at that particular place until some change is made in the subdivision of the string, which changes the position or point at which the vibrations were before strongest. This

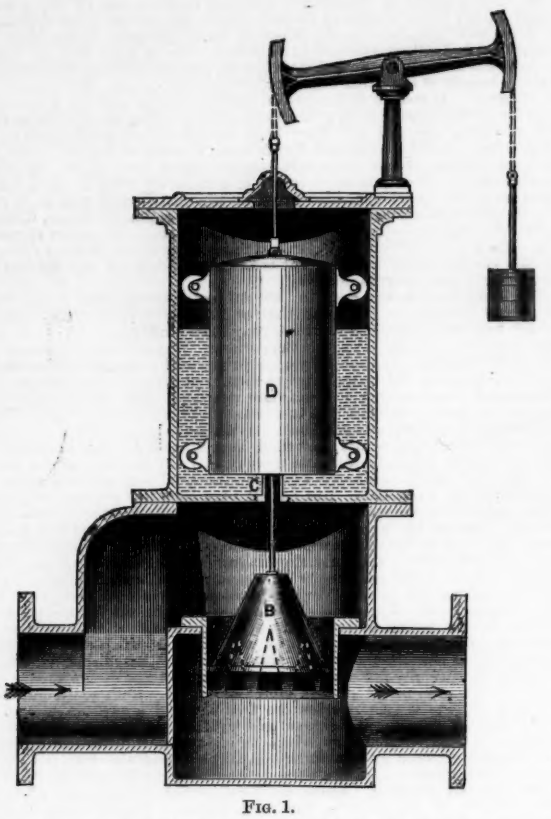

FIG. 1.

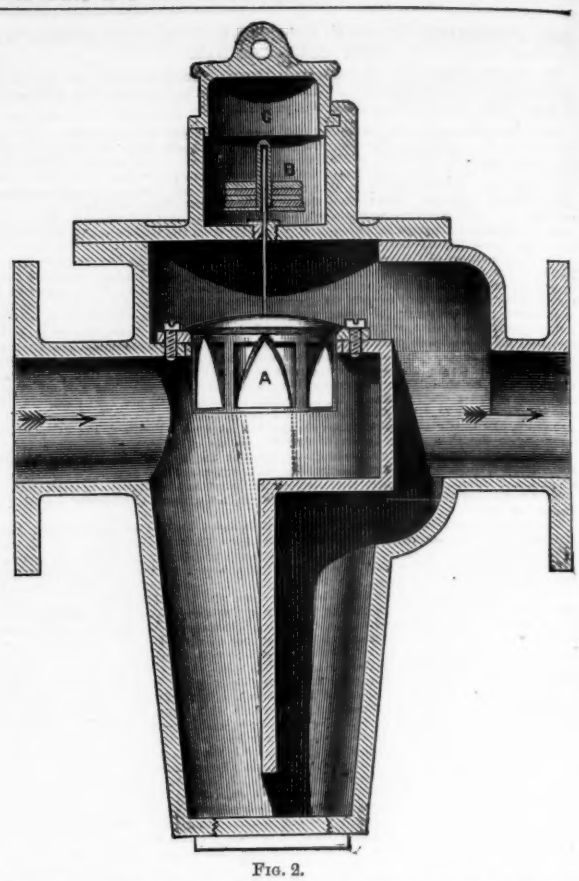

FIG. 2.

may, perhaps, be considered a little far-fetched, but what may be called the capricious behaviour of the governor in commencing to pulsate without any apparent cause may yet be found to have some definite relation to certain proportions of the bell and the valve, and certain relations between the inlet and outlet pressure, in conjunction with the quantity of gas passing through the valve. The mere size of the bell will not altogether prevent pulsations, therefore something else must be sought for and applied in order to stop them altogether. In the common governor the parabolic form of valve gives the best results, the reason in my opinion being that when near the closing point a good traverse of valve may be allowed without a great difference being made in the volume of gas delivered, but even with it at some particular point, and after years of good behaviour, pulsation will set in, and defy all efforts to stop it unless additional friction be applied to the moving parts, which takes away the delicacy of action so much desired and looked for. After many trials of different forms of valves, I constructed one which in a manner acts as if it were six different valves. It is something in appearance like a drum, and the angular or parabolic openings are not unlike the outline of the tension cords for tightening the drum-head. These openings are made to open or uncover in successive stages, and are very effectual in keeping back pulsations, besides allowing the governor to be made of much smaller dimensions than usual.

I have already alluded to the Goldsworthy Gurney governor, and stated that it has a bell and a valve of the same diameter. These are connected by a tubular stem, and the inlet gas acts on the top of the bell and the under side of the valve, the inlet pressure being thus neutralized. The action of the governor depends on the outlet pressure alone, but the valve being large and of the same diameter as the bell, a small traverse gives a large delivery of gas, which at once sets up pulsations and spoils the action of the governor. I have adopted quite a different arrangement from that, as will be seen from the engraving fig. 1, in which A represents the openings cut in the drum-valve, B, which is connected with the bell, D, by a rod passing up the central pipe, C, through which pipe also the gas reaches the bell. A weighted lever is applied to counterbalance part of the weight of the valve and bell, or a float may be fixed to the bell for that purpose. In order to obviate the tendency to pulsate, the valve-seat is made of the peculiar form shown—having a perforated shell with angular openings, which the valve uncovers successively. I have found this arrangement gives excellent results, both as regards delicacy of action and freedom from pulsations. Those now in use are giving every satisfaction.

Following up the same idea, I adopted the drum-valve in the construction of a dry metallic district governor for reducing pressure in street-mains. (See fig. 2.) The objection to governors with leather diaphragms for such situations has been urged, and not without reason, and I wished to get rid of leather and liquid also. The valve of this new district governor is made of block tin, and kept so tight as to come into action at a pressure of from 5 to 7-10ths. It responds to the action of the station-governor, and enables the manager to work with a reduced pressure in particular districts during the day, which is increased automatically when pressure is put on at the works. The valve is of delicate construction, and, like a wet meter cylinder requires careful handling when out of its place, but when once in its seat it will do its work without care or attention, and being made of block tin may be expected to last as long as, if not longer than a meter cylinder, seeing that it is never in contact with water. I have no doubt these governors will be found to supply a want which has long been felt, in connection with the control of pressure in districts where altitude or other disturbing elements interfere with proper distribution and supply.

This finishes the subject so far as the gas manager is concerned, with the exception of public lamps. We have now conveyed the gas as far as the meter, and there we are compelled to leave it to be handled by the gas-fitter as he best thinks fit. But before quitting this part of the subject I should like to make a short quotation from the discussion which took place after the reading of an excellent paper by Mr. Chew, of Blackpool, on "The Distributing Apparatus from the Gasholder to the Consumers Burner," reported in the JOURNAL OF GAS LIGHTING, published on Tuesday, the 16th of September. In summing up the discussion, Mr. Newbigging, the eminent Consulting Gas Engineer, President of the Manchester District Institution of Gas Engineers, said: "Reverting to the subject of leakage, he had just been making a rough calculation that in this country about 90,000 million cubic feet of gas was made per annum. Supposing the leakage on this to be 10 per cent., that would be 9000 millions, and taking this quantity at 2s. per 1000 feet, the total money value of the leakage would be represented by £900,000. Here was a mine of wealth in which all gas managers might dig, and of which they all might secure their proportionate share."

Having so lately spoken of the needle lamp governor, I need not now say much about it, but I make no apology for bringing under your notice and showing you the effects of pressure in destroying the illuminating power of gas. No doubt there are few who are not quite aware of the deteriorating effect of pressure on a gas-flame; but, on the other hand, I believe there are not many who have seen a series of gas-flames burning simultaneously at different pressures, while passing the same quantity of gas, and I think if any manager had a small apparatus like that now before us to show the quality of his gas to grumbling consumers, it would do more good than advancing arguments which the grumblers cannot understand, or making statements they are doubtful about believing.

These [pointing to four needle governors arranged as illustrated in the JOURNAL for Aug. 5, p. 219] four needle lamp governors are each set to consume exactly 5 cubic feet of gas per hour—the first at 3-10ths, the second at 8-10ths, the third at 13-10ths, and the fourth at 17-10ths pressure. It needs no argument of mine to show what the apparatus so clearly proves, and yet I believe there are some here who, looking at the extraordinary difference in the illuminating power of the flames, will doubt whether it can be possible that the first and fourth burners are actually burning 5 cubic feet. I do not blame them, and were these two flames placed in separate rooms, a doubt might not unreasonably be raised as to whether they were burning the same gas. I assure you they have been carefully rated, and their accuracy may be relied upon.

I now briefly call your attention to the needle governor burners—fig. 3 is an illustration of one, half size—for ordinary use in our gaseliers and brackets. These do all that the large-sized lamp governors do, although they are not rated to pass an exact quantity of gas per hour. But they may be used with confidence where perfect combustion is wished, and the full illuminating power of the gas desired, along with a purer and less heated atmosphere than where ordinary burners are employed. We shall try them at pressures varying from 8 to 30-10ths, and we shall see that while the common burner flares up as the pressure is increased, the flame of the needle governor burner is practically the same at all pressures. Taking Mr. Newbigging's estimate of loss by leakage, I should be inclined to say that much more loss is suffered from excessive pressure at the burner. That is a point which will more and more force itself on gas engineers, and I believe the day is not far distant when their advice will be eagerly sought by consumers, instead of being doubted, as is too often the case at present. Exhibitions of gas apparatus, such as that which took place at Greenock, tend to bring the gas maker and the gas consumer face to face, and the makers of the apparatus do good service to both. Before long I believe every gas company will have attached to its offices an exhibition-room, where the best forms of gas-stoves for cooking and heating, and the best kinds of burners, globes, &c., for the purpose of lighting will be always ready to be shown. Ocular demonstration is the easiest way of convincing people. The proverbial phrase, "Seeing is believing," can never be more appropriately applied than in connection with the development of the illuminating power of coal gas.

FIG. 3.

Discussion.

Mr. WATSON (Stirling), referring to the experiment which had been performed with the four governor burners, questioned whether the first and

fourth burners were both passing 5 feet of gas an hour. The smaller one, he said, appeared to be consuming more like 2½ feet an hour.

Mr. JEFFREY (Kirkintilloch) said this only showed how beautifully the needle governor controlled the flow of gas. He thought this was a subject that had not been sufficiently ventilated by gas managers themselves. For himself, he could hardly believe the result. He considered it their duty, as gas managers, to advise consumers as to the best mode of burning gas, as he believed, by the present mode, from 20 to 30 per cent. of that used was lost.

Mr. PEEBLES: In some cases more than 50 per cent.

Mr. ADAMSON (Anstruther) asked Mr. Peebles if he had any theory to account for the difference, except the increased pressure.

Mr. PEEBLES said this point was discussed at the recent meeting of the North British Association of Gas Managers at Edinburgh, and the theory advanced by chemists was there upheld—viz., that with the small burner the gas issued at a much greater velocity than with the large burner, and therefore forced itself against the air and mingled freely with it, thus getting a large supply of oxygen. The hydrogen had not time, as it were, to release the carbon, so that part of the hydrocarbon burned as a gas, while with the large burner the gas issued slowly at a low pressure, and had not an opportunity of mixing freely with the air. The hydrogen in this case showed its affinity for oxygen by seizing on it and releasing part of the carbon with which it had been combined, and these particles were raised to incandescence by the high heat of the burning gases, hydrogen, oxygen, and part of the unreleased carbon, thus giving a beautiful large flame.

Mr. ADAMSON remarked that the larger flame was yellower and more sluggish than the other.

Mr. PEEBLES said that it was, and the higher the pressure the less luminous the flame became. With regard to Mr. Watson's remark, he said that the difference between the flames of the first and fourth burners was something extraordinary, and with English gas it would be still more marked. The lower the illuminating power of the gas, the less pressure must be applied in burning it, and this was the experience of all those who had had anything to do with air gas, especially when the lightest portion of the volatile carburetting fluid had passed away. In such cases the pressure must be exceedingly low in order to get any illuminating power at all.

Mr. M'GILCHRIST (Dumbarton) said he tested some of Mr. Peebles's governors when they were first introduced, and found that up to 4 inches of pressure the quantity of gas consumed was practically the same. If, therefore, the four burners exhibited had been tested up to 2 inches of pressure, and at that pressure the four each consumed 5 cubic feet of gas per hour, he held that the proportionate consumption must be the same—viz., if the burner that was giving the best flame was not consuming 5 feet of gas per hour, then the smaller burner would be consuming just in the same ratio, because in conducting his experiments he found no difference between 1 inch and 4 inches of pressure. There should then be no difference here, and the illustration given should be proportionately correct with 17-10ths pressure.

Mr. NIVEN (Dunoon) said there was no doubt of this, that if "seeing is believing," as Mr. Peebles said, he had contradicted the proverb, because seeing his experiment was not believing that the burners were all the same size. Mr. Peebles proved by acts that seeing was not believing. Independent of that, however, if one looked to the small and the large burner, he would not say they were passing the same amount of gas; but he supposed they would burn the same amount of gas whether it were 5, 4, or 3 feet per hour.

Mr. PEEBLES: If they are adjusted to do so.

Mr. NIVEN from that inferred that if he wished a low pressure at his works, the better way would be to have the consumers provided with large-sized burners; but supposing the pressure in one place was 3-10ths and in another 17-10ths, he asked could he advocate larger burners in those districts of the town where there was the low pressure, and would the needle governor burners bring out the value of the gas in other parts where there was higher pressure?

Mr. PEEBLES: Decidedly.

Mr. NIVEN said he was exceedingly well pleased with what he had seen, and also with the philosophical spirit with which Mr. Peebles carried out a practical matter. He gave the reason why, and that constituted the philosophic spirit.

Mr. PEEBLES said that when people wished to economize they rushed to small burners, thinking that if they kept down the size of the flame, they would also keep down the gas account. Instead of doing that, if they were wise, they would adopt large burners, and reduce the pressure. His arrangement of burners proved this point most conclusively. It was an apparatus that every gas manager ought to have beside him. It was not an expensive thing, and when he stated that "seeing is believing," he meant that there must be some indisputable practical basis for a standpoint to begin from. This must be proved by burning 5 cubic feet through each of the burners, testing their correctness as to the rate by an experimenting meter, and when satisfied that they were each burning 5 cubic feet per hour, the size of the flame must be observed, as had been done that day. "Seeing is believing" then became a truism.

Mr. NIVEN asked if there was any peculiarity in the burners.

Mr. PEEBLES replied that there was not; they were union jets. For English gas the batswing was the preferable burner, but for Scotch gas the union jet was undoubtedly the best.

Mr. DRYSDALE (a Director of the Bridge of Allan Gas Company) said he knew something about magic lanterns, and found that when gas was used without any cover he obtained a small light; but if the flame was enclosed in a glass shade, and a small aperture left for the atmospheric air to reach the burner, the light was more than as strong again. He asked whether the enclosed light did not burn air along with the gas.

Mr. PEEBLES said he did not know the arrangement Mr. Drysdale had for his magic lantern, but from his statement he should say that without the glass shade he mentioned, the flame was submitted to the action of a current of air, which produced the same effect as in many of the forms of gas globes having small holes at top and bottom. Such an arrangement formed a kind of chimney, and the induced current acting in conjunction with the pressure at which the gas issued, brought about the same phenomenon as was seen in the behaviour of the fourth or high-pressure burner exhibited. When the glass shade was put over the light, leaving a small aperture for the admission of atmospheric air, the draught was stopped, which was equivalent to lowering the pressure. Carbon was disengaged as before, and the necessary quantity of oxygen being allowed for perfect combustion, a high temperature was obtained, and the gas was thus consumed under the most favourable conditions for developing its full illuminating power.

Mr. ADAMSON asked what was the practical test in illuminating power.

Mr. PEEBLES said the experiments were based on, and intended to verify and show practically the tabulated results of many experiments made by Mr. Stewart, of Greenock; Dr. Macadam, of Edinburgh; Dr. Wallace, of Glasgow; and Mr. Mitchell, of Dundee; which were given in a paper he read before the Royal Scottish Society of Arts, where it was shown that an increase of only 5-10ths pressure decreased the illuminating power about 18 per cent., an increase of 8-10ths about 30 per cent., and an increase of 14-10ths decreased the illuminating power more than 50 per cent.

The PRESIDENT said he should like to hear the opinion of any member as to the district governor described by Mr. Peebles. He himself thought it was most important that gas managers should be in possession of a reliable instrument in the shape of a district governor. In some towns where the altitudes varied, these governors would be much to the benefit of the company, and would prove a blessing to the manager.

Mr. MAYER (Glasgow) said that when this subject was brought before the meeting of the North British Association at Edinburgh, a lively and exceedingly interesting discussion resulted. One point was with reference to the amount of unconsumed carbon given off by the smaller and larger flames. Mr. Peebles stated that he would make some experiments to test the question. His (Mr. Mayer's) opinion was that the smaller flame gave off, unconsumed, a great deal of the carbon of the gas, and if a marble slab were put over it, there would be carbon particles deposited more abundantly than from the others. He believed that the large burner was giving off much less unconsumed carbon, and therefore there was a greater amount of luminosity, the low initial pressure effecting more perfect combustion.

Mr. NIVEN thought the marble slab would not be a good test, because it would, to a certain extent, cool the flame, and carbon in the form of soot would then appear. Supposing there were different forms of combustion, and that in the case of the larger flame the carbon was brought into the solid form, and that was the basis of the increased luminosity, and if in the smaller flame the carbon assumed more the form of a vapour, and therefore decreased the luminosity, then he did not see how the marble slab could be a sufficient test.

Mr. PEEBLES said he thought Mr. Mayer was labouring under a wrong impression regarding the deposition of carbon that would take place by holding a marble slab over the different flames. He believed—indeed, he was certain, though he had not actually tried it—that the large flame would deposit carbon more freely than the smaller one, if submitted to the test suggested by Mr. Mayer, simply because it was nearer the smoking point; and this might be made clear if it was considered what took place when using the ordinary gas blow-pipe employed in brazing operations. It consisted of two tubes, one within the other, through which a supply of gas or air could be sent independently of each other, and by stopcocks could be mixed in any proportion wished for. If the gas alone were turned on, a long loose smoky flame was the result, which gave off a large amount of unconsumed carbon. If air were turned on very gently, the flame became shorter, more compact, and firm, while the smoke entirely disappeared; and if the supply of air were still increased, the flame would go through all the phases of combustion, from the smoky, torch-like flame on to the beautifully developed blue cone of the Bunsen burner. It was the pressure at the burning point which got rid of the smoke, and which, if unduly increased, took away the illuminating power also.

The PRESIDENT said that three winters previously some of the shopkeepers in Coatbridge asked him if it was possible to have their windows better lighted. There had been a good number of burners used, and the ceilings had been blackened. As a panacea for this evil, he applied to Mr. Peebles for some of his house governors, and put them on. Since then he had not had a single complaint as to the quality of the gas for illuminating purposes, nor of the ceilings having become black, which proved that non-scientific combustion of gas not only vitiated the air, but destroyed the furniture and paper in a room. When gas was burned at proper pressure there was no deposit of carbon.

Mr. M'GILCHRIST said that the gas world and all the gas-consuming public were much indebted to Mr. Peebles for what he had done in connection with the combustion of gas; and if he was not by the present generation awarded the amount of consideration to which he was entitled, the succeeding generation would look back upon him as one of the pioneers in the field of discovery of how properly to burn coal gas. He moved—"That the Association accords its heartiest thanks to Mr. Peebles for the way in which he responds to the request to read occasional papers."

The PRESIDENT, in reference to the district governor, said he wished to make a remark. He had one of Mr. Peebles's station governors at his works. One portion of the district with which he had to deal was low-lying, some 200 feet below the level of Coatbridge, and 2½ miles away. He was much puzzled as to the way in which he was to give the initial pressure at that part of the district, and to keep up the supply; so he asked Mr. Peebles to consider the matter—to regulate the pressure in the main street at Coatbridge so as to throw back pressure on the low-lying district. After a time he obtained from Mr. Peebles a 9-inch district governor, and he was happy to say it had given excellent results. There was an initial pressure of 3 inches at the works. This pressure was checked in the main street at a point leading to a higher level where the pressure was reduced, and this allowed the initial pressure to flow in the direction of the low-lying district. He had found the governor very reliable. In many cases it would also become a matter of great importance to reduce leakage by fixing these governors where there was an accession of pressure.

Mr. PEEBLES said: It only remains for me to thank you for your kind expressions in connection with the subject I have brought before you. It is always a great pleasure to me to come and meet so many friends, and ventilate those matters to which I have given some attention. I think it is a necessity now-a-days that engineers, without becoming what may be termed specialists, should devote themselves steadily to some particular branch of their profession. The subject of pressure and the instruments for controlling it have engaged my attention for a good number of years; and I feel what Mr. M'Gilchrist stated to be quite true—viz., that the method of properly regulating and consuming gas is only developing itself. The expressions of approval I have had from so many of you to-day are an ample reward, I can assure you, for the little I have been able to do in connection with this subject.

(To be continued.)

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

In the demand for round coals a slight improvement is generally noticeable throughout Lancashire. For house-fire consumption there is naturally an increased demand. Consumers of gas coal, although little or nothing in the shape of fresh buying is going on, are also pressing for deliveries on account of contracts; but, in addition to this there is rather more inquiry for the commoner classes of round coal for forge purposes, and steam coal for shipment is also moving off moderately well. Beyond, however, here and there slight local alterations, there is still no general advance in prices; but the market shows an upward tendency, and this is bringing forward a large number of inquiries for forward contracts, which colliery proprietors are not at all disposed to entertain. Best Wigan Arley cannot now be bought much under 8s. 6d. per ton at the pit, and in some cases 9s. is now being asked; second and inferior sorts can be bought at from 6s. to 7s., and Pemberton four-feet coal at from 6s. to 6s. 9d. per ton. The common classes of round coal are still very low and irregular in price, and range from 4s. 6d. to 5s. 3d. per ton. Burgy is only

a drug in the market, owing to the depression in the cotton trade, and 3s. 6d. to 4s. 3d. per ton at the pit is about the average price. In some districts slack is better to sell, but generally it is still only in poor demand, whilst prices continue extremely low. Good slack can be bought at from 2s. 6d. to 3s. 3d. per ton, but the common sorts are in some cases offered at under 2s. per ton at the pit.

Coke suitable for iron-making purposes is in better demand, and in some cases prices are slightly higher.

In the iron trade prices have continued to advance during the past week, local makers of pig iron having put up their quotations 3s. per ton, and for delivery into Manchester they now range at 53s. per ton for No. 3 foundry, and 52s. for No. 4 forge, less 2½ per cent. Lincolnshire and Derbyshire brands have also gone up, but the advances appear to have checked business. It is, however, only amongst speculative holders, anxious to realize that any weakness is shown, producers for the most part being so well sold that they have no need to push for new orders at present. Finished iron is higher in price, and bar and hoop makers are generally well supplied with orders. In some cases prices are fully 20s. per ton above the lowest rates lately ruling in the market, and the average quotation for Lancashire bars delivered into the Manchester district is about £6 5s. per ton.

The local production of pig iron is being still further increased, and the Wigan Coal and Iron Company are making preparations for blowing in another furnace.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The difficulty in getting coals away from the Tyne, through the short supply of tonnage, continues. Most of the medium-sized steamers are away in the Baltic, and boats are impossible to get. Under these circumstances, where odd cargoes of gas coals have been needed, high rates have been paid. As much as 7s. 9d. per ton has been offered boats to load gas coals for Dublin. The freights have been equally high for other places. The prevailing winds last week were strong, and blew from the northward. Sailing vessels on their passage to the North to load gas coals had to seek shelter of the bays and roadsteads, and the shipments of gas coals were thus short on all sides. The gas collieries were able to offer ready shipping turns—in fact, they were practically immediate. I stated last week that most of the leading gas collieries were well contracted for next year. The rate I gave—an advance of 2½ per cent. upon former quotations—is the correct one, whatever be the improvement which may be established in the iron trade over the winter; and no doubt the American demand will be kept up for some considerable time. It is believed that the rise in the price of coals this side of March, all round, will not much exceed this figure. Coke was very low a month ago, and it therefore needed a good lift. Nine-tenths of the iron which is being shipped abroad is crude or pig iron. Coke, as fuel, enters largely into its manufacture; and iron manufacturers, especially makers of hematite iron on the west side of the island, to make themselves safe, have contracted well ahead at an advance of 1s. to 1s. 6d. per ton. Coke for immediate delivery does not show much of a rise. A fair business is being done in small coals. Small coals which can be turned into coke are coming up to better values. The coking collieries indeed are getting into a much better position than could possibly have been expected some short time ago. Other branches of the coal trade, all things considered, are fairly well employed. The demand for house coals improves. Prices do not advance very much. They are delivered free on board ship at 9s. a ton, the very best.

The general manufacturing trade of the North of England continues to be very satisfactory. The shipments of iron to America from the Teesdale district are large. They are likely to continue so for some time. On account of the rise in the value of crude iron, metal castings of all sorts are higher in price; lead, too, shared an advance last week. As the Baltic business is drawing towards a termination for the season, there are very active shipments of goods thither. Fire-clay goods are not quite in such active demand; at the same time the leading factories upon the Tyne have a fair amount of orders on hand. The chemical trade is strong. Prices of all sorts of chemicals are undoubtedly better, and there are pretty good shipments to America. The timber trade is looking up, and timber merchants anticipate higher prices.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Vale of Leven Gaslight Company, having rescinded a previous resolution to reduce the price of gas from 5s. 5d. to 5s. per 1000 cubic feet, and instead having agreed for the present to undertake the lighting of the villages of Alexandria, Bonhill, and Jamestown, thus making the cost a charge upon the consumers, a meeting was lately held for the purpose of, in the meantime, winding up the Street Lighting Association. The resolution on the part of the Gas Company has not met with general approval, some people being of opinion that it would be much better to keep the gas as low in price as possible, and that the Police Act should be adopted so as to make certain that the streets are lighted as a matter of course.

In consequence of a difficulty of the same sort on the part of the inhabitants, it has been resolved at a meeting in Markinch (Fifeshire) to adopt certain clauses of the Police Act, thereby bringing about the lighting of the streets at the expense of the ratepayers.

The twenty-third annual meeting of the Newport (near Dundee) Gaslight Company was held some days ago—Mr. Robertson, of Balmore, presiding. The report stated that, after setting aside 2½ per cent. for the depreciation in the value of the permanent plant, and providing for the usual dividend of 7½ per cent. to the Shareholders, there remained a balance to be carried forward to the current year's account. The Directors had unanimously agreed to reduce the price of gas 5d. per 1000 feet, making the price 6s. 8d. instead of 7s. 1d., and it will only be 6s. 4d. to those who pay their accounts within a fortnight after they are rendered—this reduction to take effect as from the last quarterly collection in September.

As the period of the year has returned when it is customary for members of the Town Council of Glasgow to appear before their constituents, the gas supply undertaking has again been made a question for public discussion. At a meeting of the electors of the Fourth Ward, Councillor Finlay, a member of the Corporation Gas Committee, mentioned some important statistics, more particularly referring to the period that has elapsed since 1875. During the four years there had been placed 20,513 meters, 71,000 yards of street-mains had been laid, and a duplicate set of service pipes had been abolished. The price of gas had been more than once reduced, and in addition to the reduction lately announced—bringing the price to a point never touched before, 3s. 10d. per 1000 cubic feet—another reduction might soon be expected. Not only had such results been attained, but the illuminating power of the gas had been kept up to about 27 candles, and with all that their finances were in a flourishing condition.

There is now some talk of efforts being made to have an exhibition of gas apparatus in Paisley. In the meantime, no further progress is making with the proposal to hold such an exhibition in Glasgow, but it is probable that some movement will be made in the course of a few weeks when the Gas Committee is reconstituted after the November elections.

At the last meeting of the Dumfries Gas Commission it was reported by Mr. Lennox, Convener of the Gas Committee, that for the thirteen weeks ending 27th Sept., 5,689,800 cubic feet of gas had been made at the works; that the average yield of gas per ton of coals was 10,536 cubic feet; that the average price of coals was 14s. 4¾d. per ton; and that the cost of gas per 1000 feet, inclusive of residual products, was 1s. 11d., or 1s. 7d. exclusive of residual products. Compared with the same time last year, the result of their gas-making was of the most favourable character. If they went on as they had been doing, they would be able to pay off next year the £1050 lost last year, and reduce the price of gas the year following.

A Sugg double Argand burner is now in use in front of the New Corporation Buildings, Dunfermline, at the expense of the Gas Company. It is spoken of as having made a pleasing and effective improvement in street lighting, and as having given much satisfaction.

Further progress has been made during the past week or two in connection with the lighting of the St. Enoch Railway Station, Glasgow, by the electric light. There are now six lamps in use, three on each side, which are so placed as apparently to give the greatest possible amount of effect in the way of lighting the platforms on both sides of the trains of carriages. As regards the probable cost, I am unable to speak, but it is anticipated that a thorough comparative trial of gas *v.* electricity will be made before anything definite is resolved upon.

On Monday, the 13th inst., the Broughty Ferry Police Commissioners, on the recommendation of the Gas Committee, resolved that the price of gas for the current year be 4s. 7d. per 1000 cubic feet, with 5 per cent. discount for prompt payment.

Last Wednesday evening the inhabitants of the north-east part of Forfar were much alarmed by an accident which occurred at the gas-works. It appears that by the giving way of two of the columns which supported it, one of the gasholders was thrown out of gear, with the result that a large quantity of gas escaped.

A new Company is now in course of formation for the purpose of buying the gas-works in Thurso, which were erected by a company in 1842, and leased in 1871 to Mr. T. W. Stears, of Hull, for 50 years, the lease containing a clause to the effect that he could buy the works at any time during the currency of his lease, for £1200. Another condition was that the price of gas should not exceed 7s. 6d. per 1000 feet. Prior to that arrangement the price was 12s. per 1000 feet. These works have long been considered too small for the town, which has extended greatly during the last 20 years.

A special meeting of the Town Council of Dumbarton was held last Wednesday evening, when the Gas Committee's minutes were brought under consideration. They were to the effect that the Committee recommended the abolition of the rents charged for the use of gas-meters; further, that while the profits of the gas supply undertaking would admit of a reduction of 5d. per 1000 cubic feet being made, the Committee deferred recommending anything till it was seen what would be done in regard to the maintenance of the town pier. In moving the approval of the minutes, Bailie Baptie said that the meter-rents were a fertile source of annoyance to the Gas Manager, and were looked upon by the public as a grievance. The gas-works were in a flourishing condition. From the accounts just published it would be seen that there was a balance of profit of £720, although the gas was sold at 4s. 7d. per 1000 feet. The manufacture had been nearly 1½ million feet more than in the previous year, or 8¾ per cent. greater than formerly. Bailie Buchanan, in seconding the motion, said their works were second to none of the same size, and they had a Manager (Mr. M'Gilchrist) who looked after everything that was to their benefit in every shape and form. The motion was agreed to.

The Johnstone Gaslight Company have just formally announced the dissolution of that body as at April 30, 1878, by the undertaking having been acquired by the Police Commissioners of the burgh, under the provisions of the Burghs Gas Supply (Scotland) Act.

At a meeting of the Town Council of Ayr, held on Monday, the 13th inst., Councillor Graham, Convener of the Water Committee, submitted a detailed report of the water-works extension, and of the damage which the new reservoir had sustained while it was in course of construction. The total cost of the works had been over £6397, of which upwards of £1200 had been expended on the repair of two slips that had occurred in the north-east embankment of the new reservoir, and supplementary work connected with those slips.

In addressing his constituents in the Eleventh Municipal Ward of Glasgow lately, Councillor M'Lellan spoke on the subject of the water supply, and said that the Water Commissioners would soon be able to give 50 million gallons per day to the city of Glasgow, and such a supply was not to be heard of in any city in the United Kingdom.

Mr. J. M. Gale, Engineer to the Glasgow Water Commissioners, submitted his quarterly report to a meeting of the Water Committee held on the 6th inst. It said: "The quantity of water sent into the city and district during July, August, and September last averaged as follows:—From the Loch Katrine Works, 33,500,000 gallons a day; from the Gorbals Works, 3,260,000; total, 36,760,000. Average for corresponding three months of 1878, 37,424,000; decrease, 664,000. The population supplied with water, as at April of this year, has as usual been ascertained from the rate-books, and amounts to 756,910, and the average consumption of water during the first six months of the year has been 49·8 gallons a head per day, of which 7·8 gallons a head per day is sold by meter, leaving 42 gallons a head as the consumption for domestic purposes, trade supplies not under meter, and sanitary purposes. The saving of water over the population under the district meter system, which is about 82,000, amounts now to 14·3 gallons a head, or 1,171,756 gallons per day. This is an improvement of 1·3 gallons a head a day since the date of my last report."

A most anomalous condition of things has been found to exist in the financial affairs of the Edinburgh and District Water Trust. There is actually no money available for the completion of the Moorfoot Water-Works. At a meeting of the Trust held last Thursday week it was agreed to promote a Bill in the ensuing session of Parliament, authorizing further borrowing powers to the extent of £200,000. One of the speakers in the discussion to which the proposal gave rise said that it had been sworn to by their Engineer that the Moorfoot scheme would not cost more than £325,000, and now the Trust had expended the whole borrowing powers of £500,000, and wanted more.

The Glasgow pig iron market was again very excited during the past two weeks, and the daily fluctuations were very violent, though the tendency was generally downwards. As high as 68s. was paid on Monday week, and by the following Friday morning a fall of 11s. had taken place. In the afternoon, however, there was a recovery, and business was done at 60s. 6d. and 60s. 9d. cash. Down to 57s. cash was taken last Friday.

Prices have advanced and remain firm in the coal market, but otherwise there is not much alteration to report, although a slightly improved demand is reported both for house and shipping descriptions.

Llanelly Gaslight Company.—At the half-yearly meeting of this Company, held last Friday—Mr. W. Thomas presiding—the report of the Directors and the accounts were adopted, and dividends at the rate of 4½ per cent. per annum on all classes of shares were declared.

Sale of Shares in the Shipley Gas Company.—Last Wednesday, £5000 of new ordinary stock in the Shipley Gaslight Company were sold by auction, in 50 lots of £100 each. The stock bears a dividend of 7 per cent., and was bought at prices ranging from £145 to £146 10s. per £100.

Sale of Shares in the Crays Gas Company.—At the Cannon Street Hotel, last Tuesday, 50 fully paid-up £10 shares in the Crays Gas Company were sold by auction by Messrs. Baxter, Payne, and Lepper. The Company were started in 1862, and have for many years paid a good dividend, and 10 per cent. has been reached. The whole of the shares, which were sold with the dividend accrued from the 30th of September, were disposed of for £16 a piece.

The Purchase of the Margate Water-Works by the Town Council.—An extraordinary meeting of the Margate Water Company was held last Tuesday, consequent upon the purchase of their property by the Town Council. After apportioning the value of the shares, sufficient will remain of the purchase money (£59,000) to enable the Company to allow the Directors, six in number, £2000 between them; the Secretary, £1000; the Engineer, £100; the Collector, £20; and the two Auditors, £10 each; and then it is expected a further sum of £300 will be available as a final dividend. A proposition to this effect was, after a short discussion, agreed to.

The Failure of the Well-Boring Experiment at Liverpool.—At the meeting of the Liverpool Corporation Water Committee, on Monday, the 13th inst., Mr. Parry read a report of the Water Engineer (Mr. G. F. Deacon), which stated that during the previous week the average quantity of water pumped per day from the new bore-hole at Bootle had been 416,257 gallons, and from the old well 1,346,537 gallons, making a total per day from both sources of 1,762,794 gallons. On comparing these figures with those given in the Engineer's report on the 29th of September last, it would be seen that while there had been an increase of 13,989 gallons per day in the quantity raised from the new bore-hole, there had been a diminution of 13,140 gallons per day in the quantity raised from the old well. The uniform level of water in the old well had been maintained.

The Middlesbrough Gasholder-Tank Again.—At the meeting of the Middlesbrough Town Council last Tuesday, Alderman Dunning, in moving the confirmation of the minutes of the Gas Committee, in a lengthy speech referred somewhat warmly to the gas-tank, and said he had faith in the future of Middlesbrough, and he hoped that not many years would elapse before they would see a gasholder working in the tank, and then those who voted against the tank would be glad to hide their diminished heads. The tank, inclusive of 4 acres of land, had only cost £25,000, but had it not been for an incompetent contractor it would have cost them £21,000, and there were many companies who would be glad to have such a tank at 50 per cent. more than theirs had cost. He reminded the Council that the total amount expended on the gas-works capital account was £88,000, and that for the last nine years they had contributed from £40,000 to £50,000 towards the reduction of rates, and that last year, even with bad trade, after paying the interest and redemption of the money borrowed on the gas-works, and the interest and redemption on money borrowed for the tank, and reducing the price of gas, they paid over to the town the sum of £2400.

Water for Industrial Uses in New York.—According to the *Scientific American*, the cost of water for running a steam-engine in New York City is at the present time about two-thirds the cost of fuel. For example, to run an economical 1000-horse power engine should cost for fuel, at present prices for coal, about 25 dols. a day. The Croton water bill for the same is 5062 dols. a year, or nearly 17 dols. a day. For smaller engines, for each horse power up to and not exceeding 10, the charge for water is 10 dols. a year; between 10 and 15 horse power, 7·50 dols. a year; for each horse power over 15, 5 dols. a year. For all manufacturing purposes the charge for quantities of water less than 250 gallons a day is 5 cents per 100 gallons; for larger quantities the price diminishes to 2 cents per 100 gallons for quantities ranging between 6000 and 10,000 gallons a day. For still larger quantities special rates are made, never less than 1 cent per 100 gallons. Thus an establishment using 1000 gallons of water a day has to pay a water-tax of 105 dols. a year; for 10,000 gallons a day the tax is 600 dols. The splendid water system of New York is capable of supplying upwards of 100 million gallons of water a day. The actual consumption averages 90 gallons a day to each inhabitant, an amount 50 per cent. greater than that supplied to each inhabitant of Boston, Philadelphia, or any other of our great cities except Chicago, which furnishes 80 gallons a day to each inhabitant. On the introduction of waste-water meters in Liverpool, where water did not begin to be so lavishly squandered as in New York, it was found that out of every 100 gallons supplied, 70 gallons were allowed to run to waste. It is, therefore, speaking within bounds to say that, the year together, an average of 50 million gallons of water are daily wasted in our city; yet the moment a man wishes to use any small portion of such water productively, the tax gatherer comes down on him with charges, which, if not needless are certainly unreasonably excessive. The practical tendency of this policy is to prevent the establishment of new industries that have to compete with those planted in localities offering a cheaper water supply, and to drive away those that have made a beginning at New York.

The Price of Gas in Paris.—We learn from the *Journal des Usines à Gaz* that the Syndical Chamber of Textile Fabrics in Paris are procuring signatures to a petition to be presented to the Municipal Council, with the object of obtaining a reduction in the price of gas. There is no doubt, says our contemporary, that the petition will be very numerously signed, it being perfectly natural that every consumer desires to pay as little as possible for the article he consumes. At the same time the Municipal Council have no power to compel the Paris Gas Company to make a reduction in their charge. The contract between the City and the Company was freely entered into by each party to it, and it will have to run its course. There is no reason to doubt that the price of gas will some day be reduced, and the time may be less remote than is generally supposed; but it is not by means of petitions such as that emanating from the Syndical Chamber of Textile Fabrics that it will be brought about. The manufacture and supply of gas is simply a commercial undertaking like any other, and the Paris Gas Company have not a monopoly of it; they have simply the exclusive privilege of distributing the gas in the public thoroughfares, for which purpose they may open the streets and put down their mains. If a manufacturer thought he could make his own gas for less than the price charged by the Gas Company, it would be perfectly legal for him to do so, and light up his own premises; but he would have no right to carry the gas-main across a public thoroughfare for the purpose of lighting other premises, or even for supplying a branch of his own establishment separated by a common way. This privilege is enjoyed by gas companies on condition that they submit to the imposition of certain charges, such as rates for the occupation of the subsoil by their pipes, the duty levied upon the gas (which in Paris is about 6d. per 1000 cubic feet), the division of a certain proportion of their profits with the city, and so on. The prolongation of this privilege might form the basis of an arrangement between the City and the Gas Company, with respect to a reduction in the price of gas, and if such an arrangement be come to under favourable conditions, a reduction will take place, to the advantage alike of the consumer and the Company. For instance, if the Municipality were to prolong the duration of the Company's concession by 25 years, the latter would probably be able to agree to reduce the price of gas from 30 to 25 centimes per cubic mètre, or from 6s. 9d. to 5s. 8d. per 1000 cubic feet.

Register of Patents.

1243.—Cutler, S., Millwall, "*Improvements in valves.*" Patent dated March 29, 1878.

This invention has reference to hydraulic valves specially adapted for use in the manufacture and distribution of gas, and has for its object their construction in such a manner as to secure perfect soundness.

The arrangement generally consists of rectangular, square, or other shaped vessels, having partitions dividing them into several compartments, some of the partitions having an opening at the top and others at the bottom, the latter serving to shut off the flow of gas in any specified direction, by being made to constitute a lute joint, water or other liquid being led into one or more compartments, as the case may be, the valves being fitted with tubes and cocks to effect that object.

The several modifications and forms of valve included in this invention are—three-way or bye-pass valves, which can also be made to serve as stop valves; valves for inlet to several purifiers; valves for outlet to several purifiers; and centre or multiple-way valves.

The bye-pass valve, represented in the engravings, consists of a rectangular, square, or other shaped vessel, A, fig. 1 (a sectional plan). It is

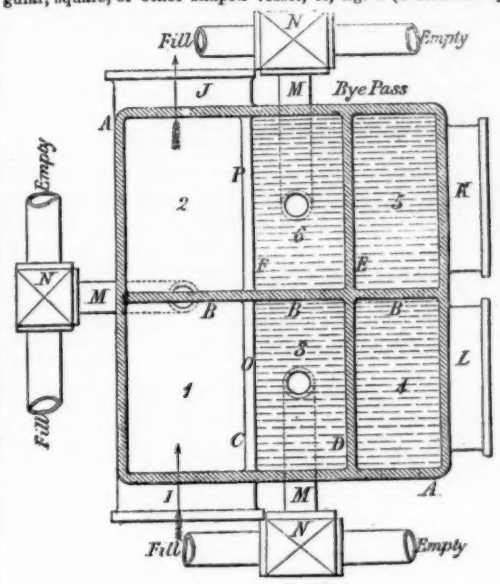

Fig. 1.

divided by partitions B, C, D, E, F, into six compartments, or three pairs of compartments, those marked 1 and 2 forming one pair, those marked 3 and 4 another, and those marked 5 and 6 another pair, the partitions dividing them respectively into pairs being open at the bottom, as at G, H, fig. 2 (which is a vertical section through fig. 1), while the pair marked 3

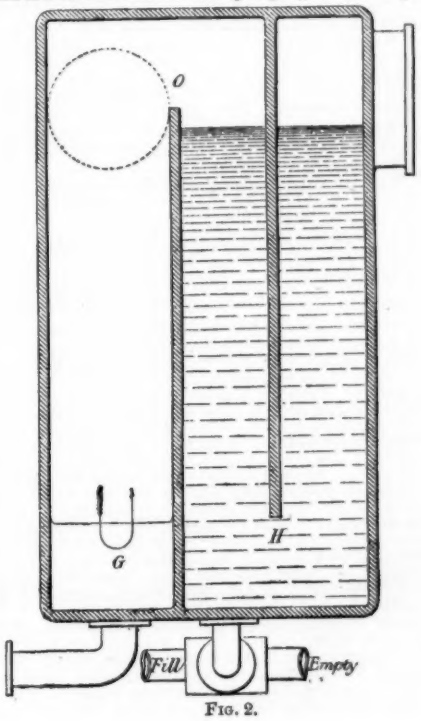

Fig. 2.

and 4 are isolated from 5 and 6 and from 1 and 2. In the upper part of the valve are connections, I, J, K, L, serving as inlet or outlet, according to the manner in which the valve is worked, and attached to the vessel there are to each pair of compartments tubes, M, for the admission and withdrawal of water or other liquid, by which the several partitions are sealed. The liquid is admitted to the required height for that purpose, and its admission controlled, by three-way or other suitable arrangement of cocks, N, fitted to the tubes.

The first or general inlet compartment communicates with the second through a space, G, fig. 2, left at the lower part of partition, B, dividing it from the second. In the same way the first compartment communicates with the third through a space, O, left in the top of the partition, dividing it from the third; the third compartment communicates with the fourth through a space, H, in the bottom of the division between them; the fifth communicates in a similar manner with the sixth; and the sixth compartment communicates with the second or general outlet by a space, P, left in the top of the partition separating them.

The mode of working the foregoing as a bye-pass or three-way valve is as follows:—To bye-pass the gas it is necessary to partially fill the third, fourth, fifth, and sixth chambers with water or other liquid, the first and second chambers remaining open. The gas will consequently be prevented from flowing in any other direction but through the opening between the first and second chambers.

When it is desired to use the valve, so that the gas is passed through apparatus connected with it, the reversal of the operation must take place, those chambers which were described as being partially filled being now empty, and those before empty partially filled.

It is to be understood that the main division is entire between the pair constituted by the third and fourth, and the pair formed by the fifth and sixth chambers, thus isolating one from the other.

In using the valve as an inlet valve only, it will be necessary to fill two of the chambers, leaving either the third and fourth or the fifth and sixth open, as the case may be, according to the direction in which the valve is worked.

It is obvious that by filling two chambers the valve may be used as an outlet valve only, or as a stop valve by filling all six compartments.

As a valve designed to control the outlets only of several purifiers or other apparatus, there is an arrangement of several chambers, with which the outlet-pipes from the several apparatus communicate. These chambers all communicate with one general outlet compartment—that is to say, in the case of a valve for four purifiers, the first and second, the third and fourth, the fifth and sixth, and the seventh and eighth, all communicate with a ninth compartment over the top of the partition between them. The partition between any pair of chambers, as that between the first and second and the third and fourth, is entire. Thus the first and second are isolated from the third and fourth; but the partition between the first and second has an opening at the bottom, thus affording a passage for the gas from the first to the second compartment, and thence over the top of the general partition between the smaller chambers and the outlet chamber. From this it will be seen that according as the smaller chambers are sealed or unsealed, so will the outlet to that purifier (or other apparatus to which it belongs) be closed or open. This valve, by increasing or decreasing the number of chambers, may be made to suit any number of outlets.

For a valve designed to control the inlets only to several purifiers or other apparatus, the foregoing is reversed, the ninth chamber being converted into the main inlet chamber, while the smaller chambers control the respective inlets. To shut off any one purifier it is therefore only necessary to seal the respective chambers controlling its inlet-pipe, and consequently either the whole number or any of them may be closed or opened at the same time.

The modification necessary to make the valve suitable for a centre valve consists in dividing the vessel into three chambers one over the other. The crude gas inlet pipe is let into the bottom of the inlet chamber. Around the walls of this chamber are formed vessels to hold the sealing liquid, into which dip-pipes are immersed. The last-mentioned pipes are attached to the bottom of the middle or working chamber, and serve to communicate when unsealed with compartments formed in the middle chamber. These compartments are constructed similarly to those of the bye-pass and other valves. They are capable of being isolated by filling the space between the divisions with water or other liquid.

When unsealed the gas can flow over the top of the partition through an opening at the bottom of the other, and over the top of the succeeding one, into other chambers situated between the pairs already mentioned. Pipes also descend from the bottom of the outlet chamber into the compartments in the middle or working chamber. These compartments communicate with the chambers before mentioned by means of the openings, therefore any other of the pipes may be made the clean outlet, according to the manner of working the purifiers, by unsealing any one and leaving the others sealed.

1252.—Adams, A., Narborough, and Coltman, T., Leicester, "*Improvements in indicating regulator cocks and valves.*" Patent dated March 30, 1878.

According to this invention, a double-barrelled chamber is bored out conically to receive a plug constructed of such diameter as to allow of its being bored out a portion of its length longitudinally, while its outer periphery has a V-shaped groove cut in it, commencing at a point and gradually increasing in width until equal to the inlet orifice in the barrel at its side. This groove communicates with the longitudinal bore, which communicates with an outlet. The stem of each plug carries a toothed wheel, which may gear into each other, or into an intermediate wheel.

1260.—Ker, A. P., Birmingham, "*Improvements in apparatus used in the purification of gas.*" Patent dated March 30, 1878.

This invention has for its object the construction of washers or scrubbers, or apparatus constituting a combined washer and scrubber, and consists in making a vessel of any form suitable to the position in which it is intended to be placed, but a rectangle or square is ordinarily the most convenient. The vessel is provided with an inlet at or near the bottom, and an outlet at or near the top. Of whatever form the exterior may be, the interior is divided by one or more horizontal partitions having, at certain places, slots or openings passing across them for the passage of the gas. These openings are made in number and size varying with the capacity of the vessel and the quantity of gas to be purified. On the upper side of the partitions, and covering the slots, are placed hoods or covers having an incline on one side carried to any convenient distance from the inlet and terminating at the outlet, the other side and ends being turned down at right angles, and resting upon the partitions. The under sides of these covers are studded with hanging rods or bars, horizontal ones being placed so as to be connected to them at intermediate spaces. These bars are for the purpose of cutting up the gas in its passage from the inlet to the outlet side of the hood.

Instead of the bars and rods it is proposed in some cases, as shown in the engravings, to use a wire netting of small mesh, corrugated and placed across the passage of the gas, and secured to the hood for the purpose of more effectually breaking up the gas in its passage. In each and every case the water level is kept to the outlet edge of the hood, in order that a copious washing and scrubbing may ensue, the slotted divisions being made to project sufficiently above the bottom to allow for the overflow at any fixed seal. A water or liquor supply-pipe is placed in any convenient position over each hood, although not positively necessary, as the division plates have each one common level, and the water introduced at any one point above them will find its way to all the overflows or slots. The inclination of the hoods either to or from the horizon ensures the gas being retained in actual contact with the water or ammoniacal liquor for a considerable time. The washer can be fixed on the top of existing scrubbers, or in a separate cistern of its own; and when the form of the case adopted is cylindrical, the gas may be introduced to the vessel and its hoods by a central or circular opening or openings.

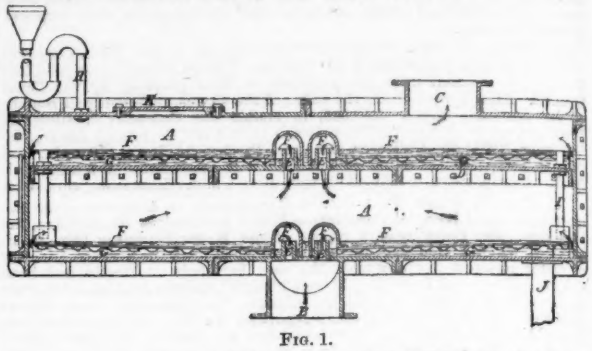

Fig. 1.

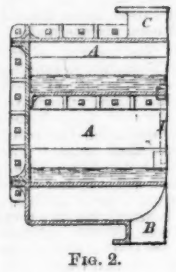

Fig. 2.

Of the accompanying illustrations, fig. 1 is a longitudinal sectional elevation; fig. 2 one-half of a transverse sectional elevation; and fig. 3 one-quarter of the apparatus in plan and one-quarter in sectional plan.

In fig. 1, A represents the body of the vessel. B, is the gas inlet, and C the gas outlet. D, D, are the horizontal partitions, and E, E, are the slots or openings covered by the hoods, F, F, which it will be observed are inclined from the horizontal. G, G, G, G, are the corrugated wire nettings before mentioned, and H is the liquor supply-pipe. I, I, are overflow-pipes, down which the liquor passes from one partition or division to the next beneath it, and J is a general overflow-pipe for conveying away all superfluous liquor. K is a lid covering a man-hole, and L, L, L (fig. 3), are the

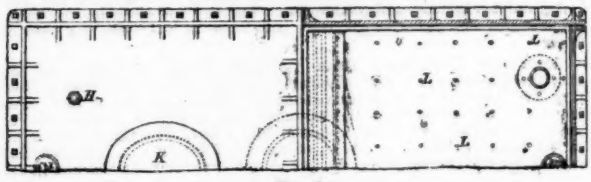

Fig. 3.

points at which the wire netting is supported or fixed to the under side of the cover or hood, F. The arrows indicate the direction in which the gas flows.

1267.—Cliff, W. D., Wortley, near Leeds, "*Improvements in the manufacture of furnaces for gas and other works.*" Patent dated March 30, 1878.

According to this invention, it is proposed to make the whole furnace, sides and arch, in one piece, or the side walls and arch may each be made in a separate piece. In some cases, for convenience of transport or otherwise, the furnaces or the arches and side walls, instead of being made in one piece in the direction of their length, may be made in sections of convenient length, say of from 4 to 6 or 8 feet, but in all cases the entire cross section of the furnace, or of the arch and walls separately, will be in one piece. Varied shapes and sections will be made to suit the different classes of furnaces, and the nostrils or draught holes for the distribution of the heat will be cut out afterwards to the requisite templates.

1280.—Bower, G., and Bower, A. S., St. Neots, "*Improvements in effecting the protection of iron and steel.*" Patent dated April 1, 1878.

This invention relates to the protection of cast or wrought iron, and of cast or wrought steel surfaces from oxidation or corrosion by atmospheric or other influences, and consists in the formation of a protective film or coating thereon of oxide or of oxides of iron, by the action of carbonic anhydrides at a suitable temperature. The carbonic anhydride may be produced by any suitable method, but preferably by the combustion of carbonic oxide.

The chemical changes which take place, and on which the operation of the process is based, are the following:—The carbonic anhydride, in presence of iron or steel, at a suitably elevated temperature, parts with one atom of oxygen, which it gives up to the iron or steel, forming an oxide or oxides of iron, and then passes off as carbonic oxide, which can if necessary be reconverted, by combustion in a sufficient amount of air or of oxygen, into carbonic anhydride.

1299.—Clark, A. M., Chancery Lane, London, "*An improved gas-lighter.*" A communication. Patent dated April 2, 1878.

This invention relates to a portable torch for lighting gas and other flames, and consists in making the lighter with a hollow stem or handle, with a tubular discharge-nozzle at its upper end, and with an adjustable air-opening near its lower end. All the parts are so arranged that upon connecting the discharge-nozzle by a suitable flexible tube with a gas-burner, the whole instrument may be filled with gas, which may afterwards be utilized, when ignited at the outlet of the nozzle, for lighting chandeliers and the like.

The invention also consists in combining with this instrument a key or wrench for opening the gas-cocks of the burners.

1306.—Hulett, D., High Holborn, Kirkham, T. N., Abingdon Street, and Chandler, S. and J., Newington Causeway, London, "*Improvements in apparatus used in the manufacture of gas.*" Patent dated April 3, 1878.

This invention consists of an improved scrubber or washer for extracting ammonia and other impurities contained in gas. In order to cause the

largest possible amount of surface to be brought into contact with the gas, and to ensure this surface being properly wetted with water or other fluid, also to prevent as much as possible back pressure being caused by the material employed, apparatus constructed in the following manner is used:—

The interior of a vessel of cast or wrought iron, or other suitable material, either square or other shape, but of much smaller dimensions than those generally used for a given make of gas, is fitted with plates or sheets of iron, or any other suitable material; or woven wire may be used from bottom to top, leaving narrow spaces between each for the passage of the gas. These sheets only touch two sides of the vessel, the others being required for the gas-way, as hereafter described; and the whole of the surfaces are perforated in order to allow the water or other fluid to descend through them. Vertical sheets are also placed side by side, leaving narrow spaces at the lower part of the vessel, and these may occupy a part or any portion of the vessel, or be used separately or conjointly with the horizontal sheets, as also may the horizontal sheets; the same object in either case being attained—viz., obtaining surfaces and forming narrow spaces for the purification of the gas or other vapours. The whole of the sheets first referred to are divided off into sets by means of plates being fitted from one of the sides left for the gas-way, allowing in each instance a sufficient number of open spaces, so as not to retard the passage of gas; that is, the divided open area of the narrow spaces forming one set shall be more than equal to that of the inlet-pipe to the apparatus. The plates dividing the sheets into sets strike off from opposite sides of the vessel.

The action of the apparatus is as follows:—The water is admitted at the top, descends through the holes in the sheets, and wets the surfaces through which the gas has to pass, and on its descent it becomes more highly charged with ammonia and other impurities, finally leaving at the lower part of the vessel; but in the event of the vertical sheets alone being used, then the water would have a direct course from top to bottom, wetting the surfaces in its passage, which the ascending gas meets. The gas to be treated enters amongst the first set of surfaces, which are wetted with strong liquor, and on its ascent meets liquor of a less strength, and finally clear water.

APPLICATIONS FOR LETTERS PATENT.

4101.—Emmett, C., and Cousins, J. J., Leeds, "Improvements in gas-engines." Oct. 10, 1879.

4107.—Ellis, G. H., Walbrook, London, "An improved pipe joint." Oct. 10, 1879.

4109.—Masters, H., Bristol, "Improvements in apparatus for controlling the opening and closing of the inlet and outlet cocks of baths, cisterns, lavatory basins, and such like, to prevent their being both open at the same time." Oct. 10, 1879.

4115.—Kendrick, I., Camberwell Road, London, "Improvements in the manufacture of gas from crude petroleum, shale oil, and carbonaceous oils generally, and in the apparatus employed therefor." Oct. 11, 1879.

4127.—Brin, Q. L., Shepherd's Bush, London, "Improvements in the production of light and heat, and in apparatus for same." Partly a communication. Oct. 11, 1879.

4166.—Clark, A. M., Chancery Lane, London, "Improved apparatus for carburetting air and supplying carburetted air for illuminating purposes." A communication. Oct. 15, 1879.

4182.—Gore, G., Balsall Heath, Worcester, "Improvements in lighting railway carriages with gas, and in the apparatus to be used therewith." Oct. 16, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1553.—Waddell, C. J., Manchester, "Improvements in taps for fluids." April 19, 1879.

2402.—Edison, T. A., Menlo Park, U.S.A., "Improvements in electric lights, and in apparatus for developing electric currents and regulating the action of the same." June 17, 1879.

2744.—Whyte, G., Elgin, N.B., "Improvements in the construction and action of electric lamps or lights, or mechanism connected therewith." July 5, 1879.

2922.—Wilson, T. and G., Glasgow, "Improvements in pumps for pumping, compressing, or forcing air, water, gas, or other fluids or liquids." July 18, 1879.

3224.—Lake, W. R., Southampton Buildings, London, "Improvements in the construction of clack-valves." A communication. Aug. 11, 1879.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3756.—Wirth, F., "An improved method of treating spent materials from the gas-works by recovery of sulphur." Sept. 26, 1876.

3882.—M'Kendrick, J., Ball, H. W., and Watson, R. G., "A new or improved fluid motor pump or meter, and valves and valve gearing therefor." Oct. 7, 1876.

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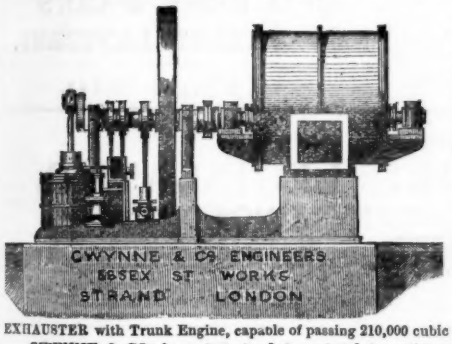

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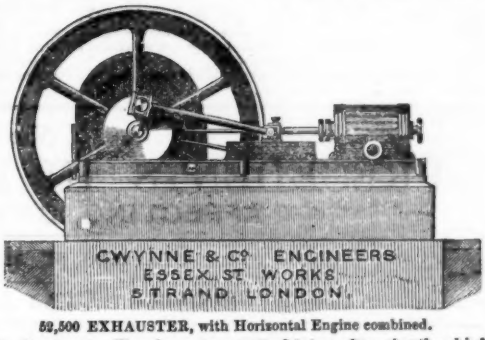

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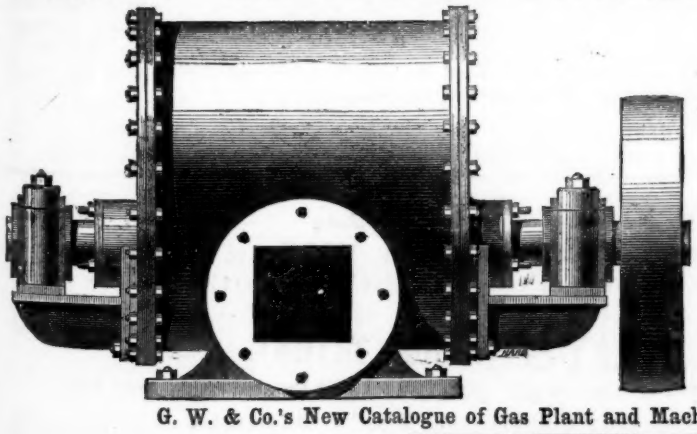

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WANTED, Readers of the NEW Edition, 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED to Lease, a medium-sized Gas-Works. Midland Counties preferred. Highest references given.
Apply, by letter, to No. 595, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, the son of a Gas Manager, a Situation as ASSISTANT MANAGER. Fair Draughtsman. Five years experience in the Manufacture of Sulphate of Ammonia.
Address No. 597, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a Situation as MANAGER or ASSISTANT MANAGER of a large Works. Has had every experience in a Gas-Works. Satisfactory reasons for wishing to change. Good references and testimonials.
Address No. 589, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Re-engagement as Working Manager of a small Gas-Works. Has a practical knowledge of the Manufacture and Distribution of Gas, Retort-Setting, Main and Service Laying, Meter Fixing, and Indoor Fittings. Unexceptionable references.
Address T. S., care of Mr. Anderson, 35A, Great George Street, WESTMINSTER, S.W.

PORTSEA ISLAND GAS COMPANY.

WANTED, a Meter Repairer who thoroughly understands the Working and Manufacture of both Wet and Dry Meters. Wages 37s. 6d. per week. The strictest investigation will be made as to sobriety and qualification.
S. B. DARWIN, Secretary.

TO GAS COMPANIES.

WANTED, by an Energetic Man, aged 35, a Situation as MANAGER, or SECRETARY and MANAGER, at home or abroad. Has had nine years practical experience in the whole routine. Salary fixed, or paid according to results. Satisfactory reasons for desiring to change. Excellent testimonials and references.
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A Young Man, who has had several years experience as Book-keeper, Collector, &c., in the Offices of Gas and Water Companies, desires Situation. Good references from present employers.
Address No. 599, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AS Working Manager or Foreman of Gas-Works. Can do anything in the Manufacture or Distribution of Gas, Meter Repairing or Fixing, Smithing, Plumbing, and any repairs in the Works.
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A Gentleman with a valuable Connection among Gas Companies in the North Midland districts is desirous of representing a good Firm in Dry and Wet Gas-Meters, on Commission and Expenses.
Address B., care of W. H. Bennett, Esq., 22, Great George Street, WESTMINSTER, S.W.

SIX POUNDS PER CENT. DEBENTURES FOR SALE.

TO be Sold at Par, £4000 of First Mortgage Debentures, in sums of £100 and upwards, in the English Company of the Buenos Ayres Gas Company, Limited. The debentures have about eight years to run, and the coupons are paid in London with the utmost regularity.
Address No. 598, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.
Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.
Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
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Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

BARNET DISTRICT GAS AND WATER COMPANY.
Incorporated by Act of Parliament.

FOUR PER CENT. MORTGAGE BONDS.

NOTICE is hereby given that the Directors of the above Company are prepared to receive APPLICATIONS for 4 per cent. Mortgage Bonds in sums of £50 and upwards (not being fractions of £50), for a term of Three, Five, or Seven years. Coupons (attached to bonds) payable half yearly, on the 1st of January and the 1st of July.
Forms of application can be obtained at the Offices of the Company, No. 30, Gracechurch Street, LONDON, E.C.
By order,
Oct. 1879. ALFRED LASS Secretary.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.
For price, apply to THOMAS PIGGOTT AND Co., Spring Hill, BIRMINGHAM.

RADCLIFFE AND PILKINGTON GAS COMPANY.

THE Directors are in want of a Person competent to fill the office of MANAGER and SECRETARY to the Company. A statement of the duties, amount of salary, &c., may be had on application to Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.
Applications, with testimonials as to character and ability, to be sent to THOMAS STATTER, Esq., Stand Hall, WHITEFIELD, Chairman of the Company, not later than Wednesday, the 29th inst.
Gas Offices, Radcliffe, Oct. 14, 1879.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for a Corrugated IRON ROOF for a Coal Store at their Basin Station.
Plans, specifications, and conditions of the same may be seen on application to the Engineer, at the Basin Gas-Works, and tenders, endorsed "Tender for Iron Roof," to be sent to me, the undersigned, on or before Thursday, Nov. 6, 1879.
The Directors do not bind themselves to accept the lowest or any tender. By order,
W. A. PADFIELD, Secretary.
Gaslight Offices, North Street, Exeter, Oct. 16, 1879.

GAS LIGHTING IMPROVEMENTS.

GEO. BRAY & CO.'S NEW PATENT LANTERNS.

See Page 640.

Now Ready, Price One Guinea,

PRECEDENTS IN PRIVATE BILL LEGISLATION
AFFECTING GAS AND WATER UNDERTAKINGS.

COMPILED BY MR. G. W. STEVENSON, C.E., F.G.S.

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ON THE
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OF
COAL GAS.

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CANNEL COAL,

Yielding 11,250 cubic feet of 22·50 sperm candle gas per ton; 1520 lbs. of coke per ton.

Present Price, 16s. per Ton at Pit's Mouth.

ALSO

CANNEL NUTS (same Mine),

Yielding 9875 cubic feet of 18·25 sperm candle gas per ton; 1500 lbs. of coke per ton.

Present Price, 9s. per Ton at Pit's Mouth.

Any Quantity supplied at once, or by Time Contract.

THE DUKINFIELD COLLIERY COMPANY, DUKINFIELD, CHESHIRE.

TO GASHOLDER BUILDERS.

TENDERS are required by the South Metropolitan Gas Company for a Three-Lift TELESCOPIC GASHOLDER, 214 ft. diameter and 53 ft. 6 in. deep, the total height, when full, to be nearly 160 feet, and the contents over 5 million feet.

Specifications and plans may be seen on application at the works, 589, Old Kent Road, S.E.

Tenders to be sent in on or before the morning of Monday, Nov. 10 next.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
GEORGE LIVESEY, Secretary and Engineer.

Oct. 17, 1879.

OLDBURY LOCAL BOARD GAS-WORKS.

THE Oldbury Local Board are prepared to receive TENDERS for the Erection of a New GAS-WORKS, to supply their district with gas.

The drawings and specification may be seen on application to the Engineer, Mr. A. Upward, 8, Queen Anne's Gate, Westminster, on and after Wednesday, Sept. 10, 1879, and sealed tenders are to be delivered to me, the undersigned, on or before Monday, Nov. 3, 1879, addressed to the Chairman and Members of the Oldbury Local Board.

Forms of tender may be obtained at the Office of the Engineer on payment of one guinea, which will be returned on the receipt of a *bonâ fide* tender on the form supplied.

The Board do not bind themselves to accept the lowest or any tender.

A. WRIGHT, Solicitor, Clerk to the Board.

Board Room, Oldbury, Sept. 23, 1879.

THE Corporation of Southport invite TENDERS for the Supply of Two 14-in. and Two 18-in. GAS-VALVES.

Particulars may be obtained on application to the Manager, Gas-Works, Southport.

Tenders, endorsed "Valve," to be sent to me on or before Wednesday, the 29th inst.

By order,
KEIGHLEY WALTON, Town Clerk.

BANGOR LOCAL BOARD.

THE Bangor Local Board are prepared to receive TENDERS for the Erection, at their Gas-Works at Bangor, of Four Dry Lime PURIFIERS, with connections; a Wrought-Iron Slated ROOF, for covering purifier-house; also a quantity of 6-in. Cast-Iron SOCKET PIPES.

The drawings and specification may be seen on application to the Engineer, Mr. A. Upward, 8, Queen Anne's Gate, Westminster, or to the Manager, Water and Gas Office, Bangor, Carnarvonshire, on and after Wednesday, Oct. 22, 1879.

Sealed tenders are to be addressed to the Chairman and Members of the Gas Committee of the Local Board, Bangor, endorsed "Tender for Purifiers, &c.," under cover to Mr. A. Upward, as above, on or before Monday, Nov. 3, 1879.

A form of tender may be obtained at the Office of the Engineer on payment of one guinea, which will be returned on receipt of a *bona fide* tender on the form supplied.

The Board do not bind themselves to accept the lowest or any tender.

By order,
D. WHITE, Manager.

Board Room, Bangor, Oct. 16, 1879.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

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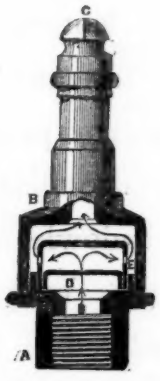

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Sample Boxes containing 1 doz., price 24s.

These Regulators are made in various forms, adjusted to pass from One-half to Sixty cubic feet per hour.

Also made to suit Consumers requirements, price 18s. per doz.

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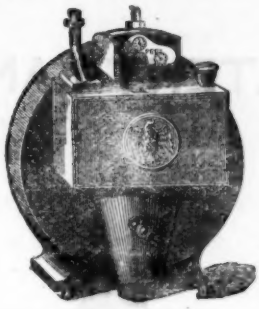

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PATENT
COMPENSATING
WET METERS,

Are, by the nature of their construction, frictionless in working.

Will allow several inches variation in water-level without any variation from correct measurement.

Under ordinary conditions need watering only once or twice a year.

The best Meters for tropical climates.

Less liable to derangement by frost than any other Meters with compensating or self-adjusting arrangements.

These improvements are, without extra charge, fitted into Street-Lamp Meters for Public Lighting.

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LIMITED,

(Formerly also Walter Ford, at Gray's Inn Road,)

KING'S ROAD, ST. PANCRAS,

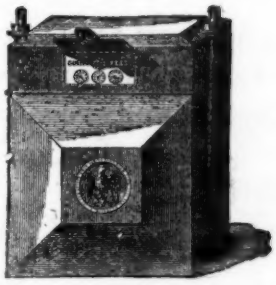
Manufacturers of

GOVERNORS,

STREET-LAMP REGULATORS,

STATION METERS,

AND OF THE IMPROVED



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STREET-LIGHTING IMPROVEMENTS.

BRAY'S
PATENT LANTERNS & FLAT-FLAME BURNERS
Of 30 to 200 CANDLES POWER.

This Apparatus has the following merits, viz.:—

The Burners are of the Flat-Flame type, which is the only practicable type for Street-Lighting purposes.

Their lighting power is greatly in excess of Flat-Flame Burners of any other make, and the up and the down light being taken into account it is in excess of that yielded by any Burners, Flat-Flame or otherwise.

The flame in the lantern is remarkable for its steadiness, whiteness, and brilliancy.

The lantern is storm proof, its efficiency not being materially affected in a gale of wind.

It is practically shadowless, though the light is allowed to pass freely to the upper parts of buildings, instead of being reflected round the base of the lamp as in some systems.

These Lamps were first exhibited in connection with the Leeds Gas Exhibition, in front of the Town Hall, in conjunction with all the improved systems of Street Lighting now before the public, when the opinions expressed by Gas Engineers and the Public were that this apparatus yielded more light and diffused it better than the other systems there tried. Since this Exhibition they have been improved in several important features, the principal of these being an arrangement whereby the flame is kept in a state of efficiency in the stormiest weather.

So long as we could see any desirable improvement to be effected, we have avoided, as far as possible, sending out our lanterns, or making any public announcement regarding them. We now feel convinced that our apparatus is nearer perfection than any in the market, and offer it with complete confidence.

Price and Particulars on application to

GEO. BRAY & CO.,
LAMP AND "ENAMEL" BURNER MANUFACTURERS,
LEEDS.

Now ready, price 6d. and 1s.

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SOFTENING AND PURIFICATION

OF

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ON AN IMPROVED SYSTEM.

PART I. explains the application of the system to large or small supplies for Private Mansions, Schools, Colleges, Asylums, Hospitals, Public Institutions, &c. Price 6d.

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Illuminating power, 24 candles. Good Coke, 11¼ cwt. to the ton.

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INDESTRUCTIBLE FUEL FOR GAS-FIRES.

REDUCTION IN PRICES.

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WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

W. C. HOLMES & Co.,

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REFERENCES TO UPWARDS OF 400 WORKS.

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COMMERCIAL GLASS WORKS.

BEST OPAL SHEET GLASS, IN CASES OF 200 FEET.

150 Y	7d. per foot.	26 Y	11d. per foot.
21 Y	9d. ,,	32 Y	1s. 3d. ,,

Enamelled Sheet Glass, Flint and Opal, 1s. 2d. Coloured Glass and Opal, 1s. 6d. to 2s. 6d. per foot.

GAS GLASSES OF ALL DESCRIPTIONS ON HAND; SPECIAL PRICES FOR QUANTITIES.

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

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BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

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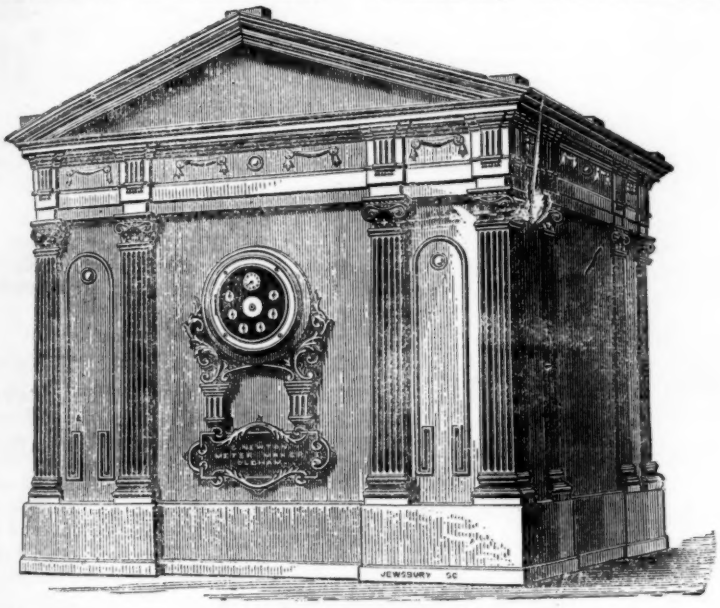

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CONSULTING GAS ENGINEER

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CANNEL COAL FACTOR,

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

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MR. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

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ECONOMY IN THE PRODUCTION OF GAS, AND CARBON DEPOSIT ENTIRELY PREVENTED.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

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Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

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Results obtained from WILLIAM SUGG'S large Argands for Street Lighting, by Mr. William King, Engineer to the Liverpool United Gas Company:—

ARGAND BURNER, WITH TWO CONCENTRIC FLAMES.

Consumption per hour. 22·2 ft.
Illuminating power . 103·7 candles.
Or 4·67 candles per foot of gas.

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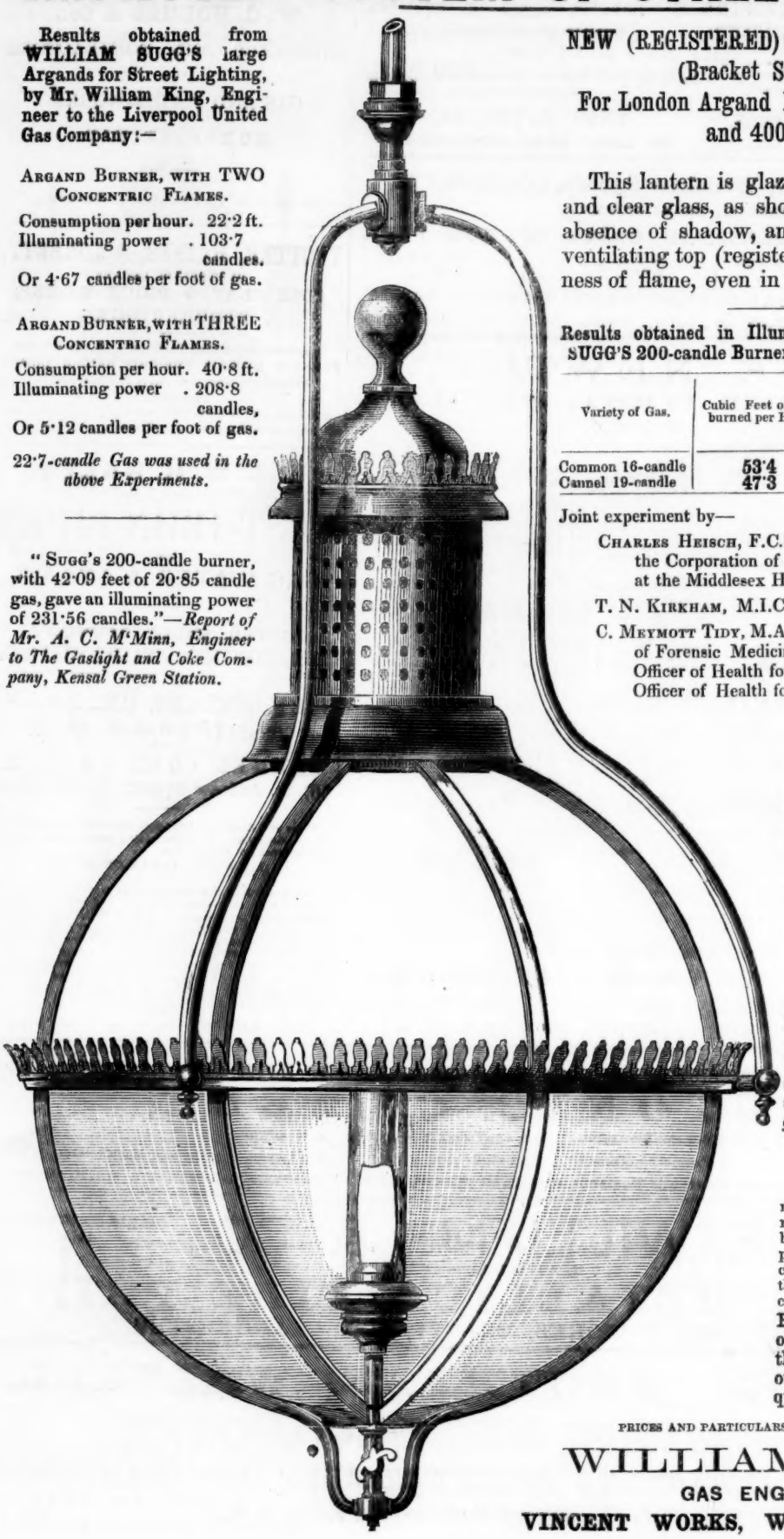
Consumption per hour. 40·8 ft.
Illuminating power . 208·8 candles,
Or 5·12 candles per foot of gas.

22·7-candle Gas was used in the above Experiments.

"SUGG's 200-candle burner, with 42·09 feet of 20·85 candle gas, gave an illuminating power of 231·56 candles."—*Report of Mr. A. C. M'Minn, Engineer to The Gaslight and Coke Company, Kensal Green Station.*



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(Bracket Suspension Light,)

For London Argand Burners of 30, 50, 100, 200, and 400-Candle Power.

This lantern is glazed with opal reflecting panes and clear glass, as shown, thus securing an entire absence of shadow, and is fitted with the new self-ventilating top (registered), ensuring perfect steadiness of flame, even in the heaviest gale of wind.

Results obtained in Illuminating Power from WILLIAM SUGG'S 200-candle Burners with Cannel and Common Gas:—

Variety of Gas.	Cubic Feet of Gas burned per Hour.	Illuminating Power in Sperm Candles burning 120 Grains per Hour.	Number of Candles to which every Cubic Foot of Gas burned is equivalent.
Common 16-candle	53·4	228	4·25
Cannel 19-candle	47·3	252	4·76

Joint experiment by—

CHARLES HEISCH, F.C.S., Superintending Gas Examiner to the Corporation of London, late Professor of Chemistry at the Middlesex Hospital.

T. N. KIRKHAM, M.I.C.E., F.C.S.

C. MEYMOTT TIDY, M.A., M.B., Professor of Chemistry and of Forensic Medicine at the London Hospital, Medical Officer of Health for Islington, and late Deputy Medical Officer of Health for the City of London.

Mr. J. R. FRITH, Engineer of the Runcorn Gas-Works, Experimenting with a Sugg's Argand with three concentric rings, obtained an illuminating power of 220·5 candles, with a consumption of 45 cubic feet of 21-candle gas, or 4·9 candles per foot.

"The light exhibited last night (SUGG's 200-candle burner and lantern) was equal to 360 candles—more than double that given by the old lamps, while the consumption of gas was exactly the same—40 feet per hour."—*Glasgow Herald*, April 25, 1879.

NOTICE.—Notwithstanding a number of statements which have been repeated in the public journals, that burners by other makers have surpassed these results, the reports of comparative experiments from which the above extracts have been copied conclusively prove that **the "Sugg" Burners give over 30 per cent. of Illuminating Power more than can be obtained from any other burners with the like quantity of gas.**

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GAS ENGINEER,

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TABLE GLASS OF ALL KINDS.

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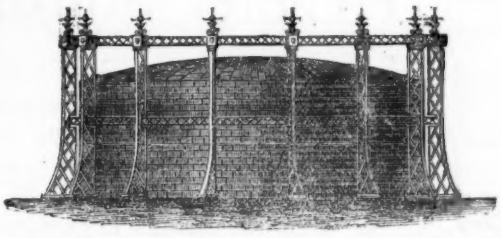

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AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

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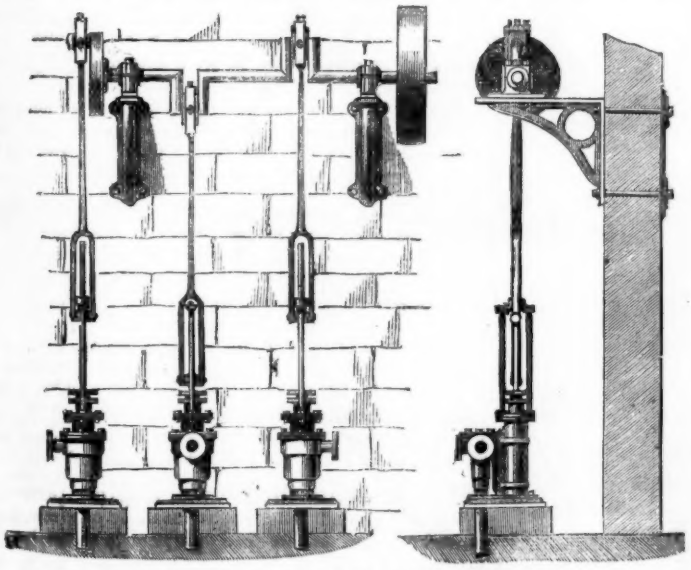
PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

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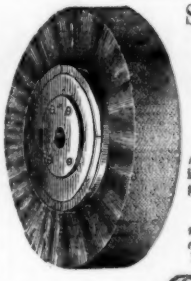


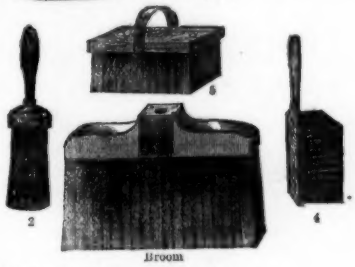
STEEL CASTING BRUSHES

FOR HAND.

Circular Casting Brushes for Lathes and Brooms,

Admirably adapted for Cleaning Hot Castings, &c., and for general use in foundries, gas-works, chemical works, &c.

As Supplied to the Government and the leading English and Foreign Engineers, Gas-Works, &c.



Broom

No. 1, Brush, 3in. wire, 2 rows, 15s. dozen.
" 2, " 5 " round, 22s. 6d. "
" 3, " 3 " 4 rows, 22s. 6d. "
" 4, " 2 " 4 " 21s. "
" 5, " 3 " 4 " 22s. 6d. "
" 6, Broom, 12in. block, 7in. wire, 4 rows, 72s. per dozen.
" 7, " 16 " 7 " 4 " 90s. "
" 8, " upright, 7 " 3 " 48s. "
" 9, " 12in. block, 7 " 10 " 180s. "
" 10, " 16 " 7 " 10 " 228s. "
" 11, " 12 " 4 " 4 " 54s. "
" 12, " 16 " 4 " 6 " 72s. "
" 13, " 12 " 4 " 10 " 138s. "
" 14, " 16 " 4 " 10 " 180s. "

								each
Wheel, 6in. dia.,	2½	wide,	1½	wire projects,	5	rows,	¾ hole,	10s.
" 8 "	2½	"	1½	"	6	"	¾ "	18s.
" 10 "	3	"	2½	"	6	"	1 "	21s.
" 12 "	3½	"	2½	"	7	"	1 "	30s. 6d.
" 14 "	3½	"	3½	"	7	"	1	36s.
" 18 "	4	"	3½	"	8	"	1½	62s. 6d.

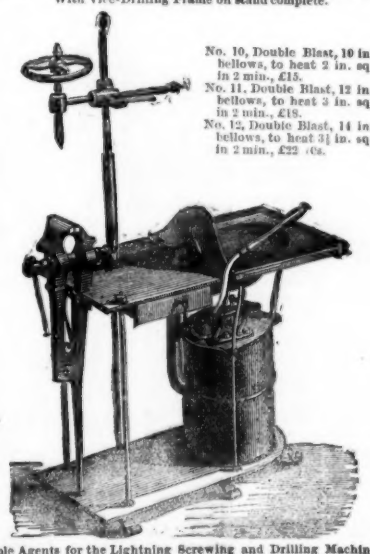
The "Champion" Iron Encased Forges.

Are specially suited for General Out-door Purposes, and will be found suitable to any climate.

No.	PRICES. SINGLE BLAST.	£ s.	No.	DOUBLE BLAST.	£ s.
1,	8 in. bellows, to heat 1 in. sq. in 2 min.	3 4	4,	8 in. bellows, to heat 1 1-8th in. sq. in 2 min.	5 10
2,	10 in. bellows, to heat 1½ in. sq. in 2 min.	3 18	5,	10 in. bellows, to heat 2 in. sq. in 2 min.	8 12
3,	12 in. bellows, to heat 2 in. sq. in 2 min.	5 18	6,	12 in. bellows, to heat 3 in. sq. in 2 min.	12 16
			7,	14 in. bellows, to heat 3½ in. sq. in 2 min.	16 16

The "Champion" Iron Encased Forge,

With Vice-Drilling Frame on stand complete.



No. 10, Double Blast, 10 in. bellows, to heat 2 in. sq. in 2 min., £15.
No. 11, Double Blast, 12 in. bellows, to heat 3 in. sq. in 2 min., £18.
No. 12, Double Blast, 14 in. bellows, to heat 3½ in. sq. in 2 min., £22 10s.

Sole Agents for the Lightning Screwing and Drilling Machines, Helical Pulley Blocks, Automatic Revolving Scrapers, Earth Borers, Tanite Co.'s Emery Wheels and Emery Grinders, Lathes, Genuine Morse Twist Drills, Cushman's Drill and Lathe Chucks, Patent Belt Screws, Patent Safety Belt Shippers, Casting Brushes, Shaped Diamonds, and a great variety of other Machinery always kept in stock or in progress.

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MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

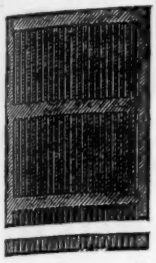
By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re- quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

R. DEMPSTER AND SON'S



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Speaking of these burners, erected on the Thames Embankment, the Governor of The Gaslight and Coke Company, at the half-yearly meeting, Aug. 15, 1879, says:

"Any gentleman who may wish to see the light, may do so at the foot of Westminster Bridge, where it is in direct contiguity with the electric light, so that he will be able to judge for himself. There is a light there that completely excels the electric light in the intensity of its illumination, and in the scope of its diffusion. The lamps on Westminster Bridge are some of Mr. Wigham's."

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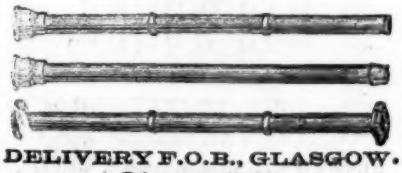

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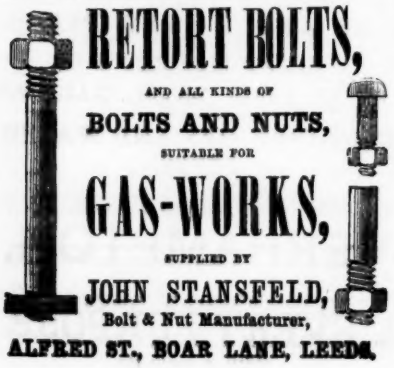

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"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

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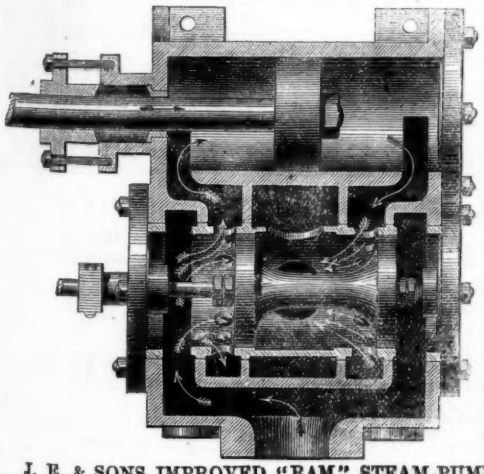

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and other Gas-Works.

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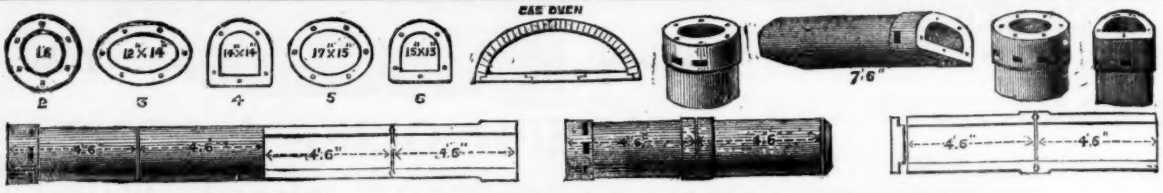

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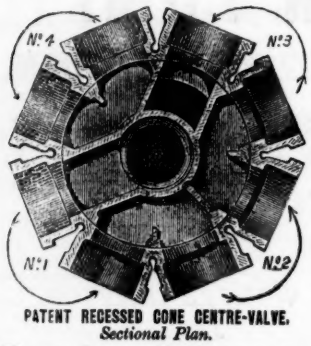

PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.

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THROUGH-WAY & FOUR-WAY COCKS
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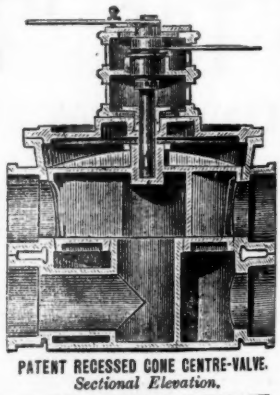
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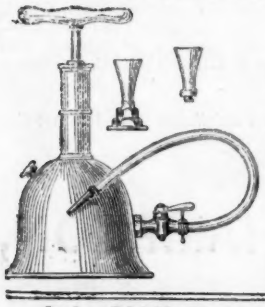

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